The
GEOGRAPHICAL JOURNAL

Vol CII Nos 5, 6 R.G.S. *Nov.—Dec. 1943*

ON ALEXANDER'S ROUTE INTO GEDROSIA: AN ARCHAEOLOGICAL TOUR IN LAS BELA

SIR AUREL STEIN, K.C.I.E., F.B.A.

In his last letter to the Editor, dated 5 August 1943, from his mountain camp in Kashmir, Sir Aurel Stein promised this paper for the Journal, and it was received 10 January 1944, ten weeks after his death at Kabul on October 26.

THE tour which between January and March of 1943 took me through the State of Las Bela, extending from the coast of the Arabian Sea to the north-eastern confines of Makran, was intended to supplement in two directions the archaeological explorations carried out by me during the cold weather season of 1928–29 in Makran and adjacent parts of ancient Gedrosia. The survey then effected along the Kech valley, Kolwa, and other tracts of British Makran had enabled me at very numerous ancient sites to discover abundant remains of pre-historic civilization which that region, now mainly desert in character, had once supported during Chalcolithic times.[1] A close connection revealed itself between these remains and the civilizations of approximately the same period, far more abundantly attested by excavations at Mohenjodaro and other important sites in the Indus valley to the east and at numerous sites of Southern Persia to the west. Las Bela had so far remained archaeologically unexplored. Yet, in view of its position between the lowermost Indus valley and the neighbouring portion of ancient Gedrosia, it seemed likely that a search for any early sites to be found there might help to throw further light on the extension of that pre-historic culture towards India.

But there was special interest in another direction also attracting attention to Las Bela. Comparatively small as that territory is and generally obscure as its past is, yet the latter presents a phase to which attaches some importance for the historical student. Las Bela was the scene of Alexander's last military operations during his invasion of India, and from it he started on

[1] See Stein, "An archaeological tour in Gedrosia." *Memoir Archaeol. Surv. India*, 43 (1931) 52–144.

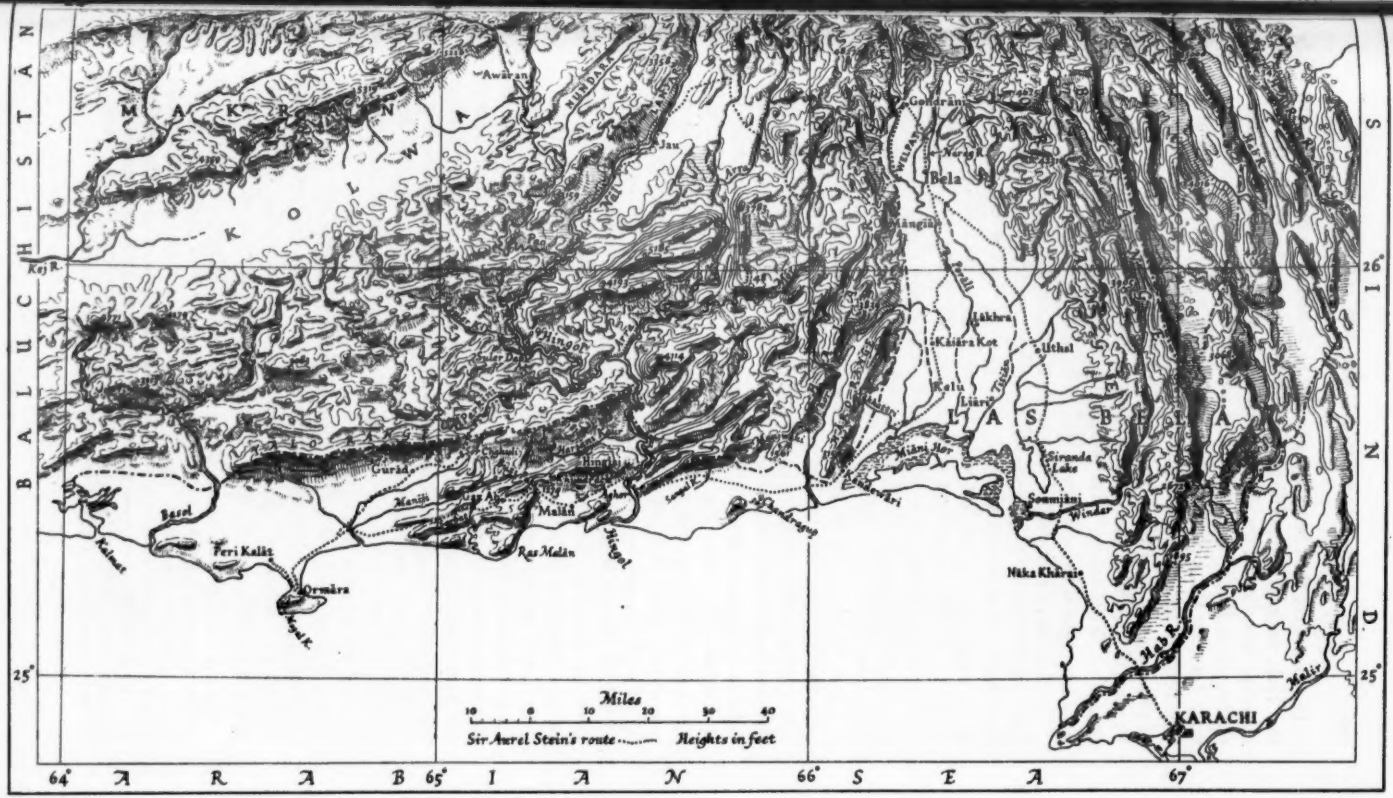
that hazardous retreat through the wastes of Gedrosia which cost his army such grave sufferings and losses as all his historians have graphically recorded. It has been recognized long ago that Las Bela corresponds to the territory of the Oreitai in which those operations took place; but the localities which witnessed them, and in particular the route which Alexander followed on his move from the country of the Oreitai towards Gedrosia, have never been definitely determined.

Before attempting to do this in the present notes it appears necessary first to sketch in brief outlines the essential geographical features of the territory comprised in the present State of Las Bela. To this may be added a succinct account of the tour which took me over a considerable portion of this ground, including such personal observations as may have a general topographical or antiquarian bearing. These notes will usefully serve also for the detailed report to be published elsewhere on the purely archaeological results of my tour.

The main portion of the Las Bela State is formed by a great triangular area stretching approximately from north to south for a direct distance of more than 100 miles. At its apex there descend numerous small valleys from an agglomeration of hill ranges rising at points to heights of more than 5000 feet; their flood-beds form the headwaters of the Porali river. This by its inundations during the monsoon rains provides fertility for parts of its great alluvial fan which steadily widens until it strikes the coast of the Arabian Sea at a stretch of some 50 miles. But for most of the year the wide branching flood beds, into which the Porali river divides after leaving the mountains, carry no water, and the very scanty and irregular rainfall received by the arid valley plain lower down does not allow the great extent of arable ground which is not reached by inundation or artificial irrigation to produce more than the thinnest desert vegetation.

This main valley of the Porali is fringed eastwards by a succession of low and utterly barren hill chains, all offshoots of the Kirthar range. Farther north this divides Las Bela and Kalat territory from the province of Sind and the great Indus valley. These hill chains of the Mor, etc., run south more or less parallel to the direction of the Kirthar until they approach the sea coast. The drainage from the narrow valleys dividing them is carried by the Hab river which debouches there. Torrents descending from the Mor, the nearest of these eastern hill chains, during the monsoon rains, add but a small quota to the irrigation resources of Las Bela, while the narrow valleys farther east allow but little room for any but pastoral occupation.

Along the western edge of the valley of the Porali and its chief tributary on that side, the Kud river, there stretches southwards the Hala range, also utterly barren. On nearing the sea coast it takes a south-westerly direction and near the mouth of the Hingol river it joins on to the Coastal Range of Makran. The Hala range northwards ends in the imposing massif of Dhrum and forms the watershed between the drainage area of the Porali and the Hingol. The latter is an important river collecting most of the drainage from the large Jhalawan hill tract far away in the north-east. This and Makran farther west form part of the present Kalat State and in ancient times must always have been included in Gedrosia.


BALUCHISTÁN
SIND
MAKRÁN COAST
KOLWA
Awáran
Jau
Hingol
Kaj R.
Gaddáni
Bela
Lakhra
Kálra Kot
Kalu
Liári
LÁSBELA
Miáni Hor
Sirondi Lake
Soonmiáni
Winder
Nuka Khársie
Hab R.
Malir
KARACHI
Gurára
Manjh
Malád
Ras Maldn
Hingol
Bazel
Kalmat
Peri Kalát
Ormára
Kalat R.
Miles
10 0 10 20 30 40
Sir Aurel Stein's route
Heights in feet
64° ARABIAN SEA 65° 66° 67°
25°
26°

Las Bela may thus be geographically reckoned as terminated westwards by the Hala range; but political circumstances, apparently in the eighteenth century, have caused the authority of the Las Bela chiefs, until quite recently feudatory to Kalat, to be extended westwards over a portion of the narrow strip between the Coastal Range and the sea as far as the inlet of Kalmat.[1] The account left us of Nearchus' voyage along the coast shows that the whole of this long and far from inviting strip of ground right up to the mouth of the Persian Gulf, which the Greeks knew as the land of the barbarous Ikhthyophagoi or "Fish-eaters," was included by them in Gedrosia. In the same way it had continued in later times, too, to be reckoned as part of Makran.

To this rapid synopsis of the chief geographical facts concerning Las Bela a few brief remarks may be added on its present economic conditions and its population ('Las Bela Gazetteer,' pp. 44 *sqq.*). In the first place it deserves to be noted that owing to the very scanty and capricious rainfall cultivation is almost wholly dependent on irrigation. Water for this is supplied chiefly by the summer floods of the Porali. These are distributed over the flat alluvial valley bottom by *bands* or barrages, roughly constructed across the branching beds of the river.

These by the very nature of the ground on the alluvial fan are liable to periodic changes, the farther away their course lies from the head of the valley. This helps to account for only a limited portion of the potentially fertile area between the barren hills on either side of the main valley being capable of permanent cultivation. Hence it is easy to understand that even as late as 1901, when the first census was taken in Las Bela, only about one-half of the population, then reckoned at 56,109 souls, or nine persons per square mile, was engaged in agriculture, this occupation, being combined with the raising of flocks, cattle, and camels.[2] Yet by then long years of British control had introduced a change from the conditions observed in 1840 by Masson who found the people of Las Bela leading an essentially pastoral life ('Las Bela Gazetteer,' p. 110).

Facilities for grazing are afforded along the torrent-beds descending from the hill chains on both sides of the main valley, but particularly near its south-eastern end where the terminal beds of the Porali and smaller streams draining the Mor and Pab ranges run down towards the coast and carry flood water to fairly extensive jungle belts lacking permanent settlement. There is plentiful grazing to be found also in the mangrove swamps lining the shore of the crescent-shaped Hor lagoon which extends along most of the southern end of the great alluvial fan.

But it is at the head of the latter in the tract of Welpat where the Porali emerges from the hills, and where its flood water can best be caught and utilized for cultivation, that the closest settled occupation of the ground by hamlets and villages is found. There, too, lies the town of Bela, the admini-

[1] See p. 193 of 'Baluchistan District Gazetteer, vol. 8, Las Bela,' a very useful publication, compiled mainly under the direction of Mr. R. Hughes-Buller.

[2] See 'Las Bela Gazetteer,' pp. 45 *sq.* It is however there noted that "owing to the drought and scarcity of food grains and fodder, a large number of the inhabitants had gone away to Sind and were absent when these estimates were prepared, and it is, therefore, probable that the population was underestimated." The Census of 1921 showed a population of 50,696 souls for the Las Bela State.

1. Small fortified island in Hingol river bed at Aghor

2 Old Rumi tombs on way from Hab river to Las Bela

3. *Sacred pool below shrine of Mai Nani, Hinglaj*

4. *Sacred image of Mai Nani, Hinglaj*

3. *Sacred pool below shrine of Mai Nani, Hinglaj*

4. *Sacred image of Mai Nani, Hinglaj*

strative and commercial centre of the State. The fact that Welpat with a population of some 15,600 souls contains more than one-fourth of the total population of the whole State sufficiently illustrates its economic preponderance in modern times. That this importance of the tract due to obvious physical advantages dates back to very early times is proved by the fact that within it are to be found at least four prehistoric sites of some size, the only ones so far traced.

It deserves to be noted that a portion of Welpat enjoys the exceptional advantage of perennial irrigation owing to the presence of springs rising in the bed of the Porali and furnishing subsoil water, such as is known as "black water," *kara-su* in Turkistan and *siah-ab* in parts of Baluchistan, which permits of two annual crops over a limited area. Starting from Bela town there leads through Welpat westwards the principal and most direct line of communication connecting Las Bela with Makran. I shall have farther on occasion to refer specially to this significant topographical fact.

As regards the present population of Las Bela it may suffice to note here that in its very mixed composition it seems curiously to reflect the varied ethnic influences to which this territory is likely to have been subjected throughout historical times. The main stock of the population to which the geographical name of *Lasi* is applied comprises five principal tribes, divided into numerous subsections. The language spoken by them is a dialect of Sindi, locally known as Jadgali. From a variety of indications it may be assumed that they represent the indigenous occupants of the territory, Indian is their ethnic relation like the Jats of Sind, and they were originally Hindu in religion before their conversion to Islam. To these confederacies or "Raj" belonged the successive families known to have ruled Las Bela.

A number of small tribes calling themselves Baluch and speaking Western Baluchi represent immigrants of Iranian stock from Makran. For the most part they have remained nomadic graziers and are found mainly in the hills eastwards. Nomadic, too, are the more numerous Brahuis who made their way into Las Bela from the high valleys of Jhalawan in the north. Their language and physical character prove them to belong to that once widespread Dravidian stock which in prehistoric times may be assumed to have occupied a great portion of the present Kalat State and adjacent portions of the Indus valley. A miscellaneous smaller group includes some tribes known to have been settled originally in Sind, as well as Khoja traders and Hindus. Among this group the fisher folk of the Meds deserve to be specially mentioned; widely spread westwards also along the Makran coast they correspond without doubt to the Ikhthyophagoi described by the Greek accounts as living on the coast beyond the Oreitai, the ways of whom they still largely retain.

Before concluding this rapid review of the physical features of Las Bela and the composite character of its population reference may be made to the trade which the position of the country has favoured in former times and which still affords some subsidiary livelihood to its camel-raising people. Until the rise of Karachi and the advent of railways up the Indus valley the small port of Sonmiani, on the south-eastern extremity of the State, served for a considerable import by sea which found its way by much frequented routes

via Bela into different parts of Southern Baluchistan and into Afghanistan also.

Section 2

I turn now to a succinct account of the tour which took me over certain main portions of the State and enabled me to gather useful impressions of the general character of the ground and its bearing on Alexander's operations as recorded by his historians. The conclusions which my observations on this tour, in conjunction with those made on my previous explorations in British Makran and the adjacent confines of south-eastern Persia, have led me to form as regards the route followed by Alexander's army on its march into and through Gedrosia, will be discussed later on.

On January 19 I proceeded from Bahawalpur for Karachi after having completed a renewed survey of ancient sites along the "lost river," the Sarasvati or Hakra. In the course of this I had been joined by Mr. Krishnadeva, a young Archaeologist Scholar, whom Mr. K. N. Dikshit, Director-General of Archaeology in India, had been good enough to depute to assist me, together with a grant of Rs.1500 to meet my out-of-pocket expenses on the proposed tour in Las Bela. A few days' halt at Karachi, under the hospitable roof of Government House where His Excellency Sir Hugh Dow, Governor of Sind, and Lady Dow had accorded me the kindest welcome, allowed me to attend to practical preparations and to meet Mr. A. H. Hopkinson, Political Agent, Kalat, then on his way back from Las Bela. By him I was also introduced to Jam Mir Ghulam Qadir Khan, Ruler of Las Bela, then on a visit to Karachi. The kindly interest shown and very helpful support given by Mr. Hopkinson greatly facilitated all subsequent arrangements for my tour.

A journey of some 116 miles in the instructive company of Khan Bahadur Nabi Bakhsh, Wazir of Las Bela, brought me on January 23 to the small town of Bela, the capital of the State. The journey done by car on the main road, ordinarily practicable for motor traffic in fair weather, though necessarily rapid, allowed of some useful observations. After 14 miles from Karachi city the road crosses the deep-cut bed of the Hab river, shallow but perennial. It forms the boundary between Sind and Las Bela. It has been long ago rightly identified with the Arabius river of the Greek accounts. Beyond it the road passes over the last low outliers of the Pab range, forming a much-broken plateau. Without permanent habitation, owing to moisture from its vicinity to the sea it affords ample grazing. A group of relief-carved tombs, known as *Rumi*, *i.e.* of Western type, and some others found elsewhere in this tract attest pastoral occupation in early Muhammadan times (Pl. 2).

After a steep descent through a tortuous gorge the coast was closely approached. Beyond this the road led through extensive belts of open jungle with much tamarisk and other tree growth. Interspersed are small scattered patches of cultivation, all dependent on floods from the Windar stream and torrents draining the hill range to the east. At increasing distance from the sea we then passed beyond its great inlet the Miani Hor to the long winding lake of Siranda which is fed by flood water from the easternmost terminal branch of the Porali river and from torrents draining the Mor hills. I shall

have occasion to refer to this lake later on. After skirting the eastern shore of the lake we left farther away to the west the village of Liari on the Titian branch of the Porali, before we arrived at the first large area of cultivation at the village of Uthal, with a group of hamlets clustered around it.

After leaving Uthal, one of the terminal oases of Las Bela, we crossed a stony waste for more than 30 miles, a typical Piedmont glacis of the Mor hills, intersected by a constant succession of shallow torrent beds, before reaching the southernmost continuous stretch of cultivation, some 8 miles below Bela.

At Bela, the seat of the administration of the State and its ruler, we stayed to collect local information and to make arrangements about transport, etc., for the journey ahead. For all these most useful assistance was received under the orders kindly issued by the ruler who throughout showed a very helpful interest in facilitating my task. In the course of two long excursions it became possible to locate four mounds where abundant surface remains proved prehistoric occupation reaching back to Chalcolithic times. They also served to acquaint me with the chief physical features which at all times must have made the cultivable ground of Welpat, as the northernmost tract of Las Bela is called, the principal area suited for settled occupation. The first of those excursions took me for some 10 miles north of Bela past two fine orchards of the Jam, enjoying perennial irrigation from "black water" of springs, and I could note how changes of the wide flood beds of the Porali river and its affluents, as marked by abandoned embankments, must have affected at different periods the area of settled occupation. Two large ancient sites were traced on conspicuous mounds to the north-east of Bela where slightly rising ground had made prolonged occupation less subject to the vagaries of the river beds.

This seems to be the case also at the town of Bela which occupies a high mound on the western bank of the broad flood bed known as Narag. No ancient remains could be traced on the surface of this mound, probably owing to the abundant refuse which finds its way from the crowded dwellings of the inhabitants to its slopes. When passing through narrow lanes on visits to the residence of the Jam, built on the highest point of the town, more than 40 feet above the foot of the mound, it was instructive to observe that apart from a few more substantial structures built with mud bricks, most of the dwellings, including the very numerous shops of the extensive Bazaar, show only timber-and-wattle walls plastered with mud. These are necessarily subject to much damage in case of exceptional rain. Such walls after abandonment of a site would leave little of recognizable remains behind. Yet where occupation of the same site had been continuous for long centuries the accumulation of debris after repeated periods of decay would be bound to prove heavy.

I noted at the time the disproportionate number of shops at Bela, some hundred, against a population of a little over four thousand. This is due largely to the amount of trade which passes through the town both to and from Makran and the adjacent parts of Jhalawan. The fact has its significance with regard to the question as to the route likely to have been followed on Alexander's march into Gedrosia.

It was this question which mainly determined the direction of the subse-

quent moves on my tour. No duly critical examination of this question was likely to have been possible for qualified historical students before this borderland of India and Iran, from which, in Lord Curzon's words, "obscurity had rarely lifted" ('Persia,' ii, 254), became known in its topographical and other essential aspects through reliable modern surveys. Yet it appears to have been generally believed ever since the days of D'Anville that Alexander's route into Gedrosia led mainly along or near the Arabian Sea coast.[1] In a modified form this view had been taken also by Colonel Sir Thomas Holdich, R.E., under whose direction the first detailed mapping of Southern Baluchistan by the Survey of India had been carried out towards the close of the last century. There were data contained in the classical records which it seemed to me to be difficult to reconcile with this view. Hence obviously it was important for a proper examination of the question to make in the first place direct personal acquaintance with the ground over which the approach to that suggested route line was assumed to have led.

In order to gain this ground we started from Bela on January 28 south towards the western edge of the alluvial flat descending towards the coast, with six camels to carry the baggage and six more to mount our party including guides. On the first march, a short one, the continuous stretch of cultivation below Bela town was left behind after some miles. Then passing across a waste with thin tamarisk growth and scrub, where decayed irrigation embankments marked abandoned fields in places, the bed of the Porali holding a shallow flow of "black water" was struck at the small hamlet of Mangia. Next day a march of more than 25 miles brought us to the site of Khaira Kot of reputed antiquity. The track lay at an increasing distance to the west of the present main course of the Porali and almost wholly across waste ground. Only at first where the route led near to the dry torrent beds descending from the low hill chain to the west, did we pass the embankments marking abandoned fields and clumps of old tamarisks. From the few scattered huts near them the cultivators were said to have moved away in recent times to ground still capable of being inundated from the Porali.

The site of Khaira Kot is marked by a patch of some 300 yards in diameter of slightly rising ground not far from a shallow depression marking an old bed of the river and holding a small sheet of fresh water left from the last summer flood. Abundant pottery debris covers the surface of the site and by its type proves occupation during mediaeval times. Some of the enamelled or otherwise decorated ceramic ware showed distinct resemblance to the pottery found by me at numerous sites of the early Muhammadan period in Persian Makran and up the coast of the Persian Gulf ('Archaeological reconnaissances,' pp. 82 *sq.*, 90 *sqq.*). Numerous fragments of Chinese stone ware, etc., suggested maritime import of a trade for which the site near the old delta of the Porali may have served as a convenient centre. In conformity with the above dating were some decayed *Rumi* tombs and fragments of copper coins of the Islamic period picked up on the surface. There was nothing whatever

[1] I base this view on the remarks made by McCrindle, 'Ancient India: its invasion by Alexander the Great,' p. 169, note 1, reference to other writers not being at present accessible to me. See also Colonel Sir T. Holdich, "A retreat from India," *J. United Service Instit. India*, 1894, pp. 112 *sqq.*

to support the location at Khaira Kot of the town founded by Alexander at the chief village of the Oreitai, as conjectured by Colonel Holdich (see p. 216).

At Khaira Kot we had approached the foot of the low and utterly barren Haro range along which the usual tract leads to the mouth of the Hingol river and thence to the sea coast at Ormara. But while letting the baggage proceed by it to the graziers' station with wells at Nakhatri, I struck south across the bare alluvial flat under the guidance of Ibrahim, an experienced old landowner who had joined us from the hamlet of Sheh Lakhra on the Porali to the east. Passing on this utterly featureless ground along a succession of shallow beds once fed by the Porali I noted at a number of places patches, covered with pottery debris, marking where small hamlets had once stood. After passing the traces of the now abandoned Indo-European Telegraph line our guide brought us to the site known as Relu where some *Rumi* tombs and ceramic debris marked mediaeval occupation as at Khaira Kot. It was interesting to note that flood water from a wandering terminal branch of the Porali had recently allowed some cultivation to be resumed in the vicinity. Finally turning south-west we gained our halting place at the mouth of the Nakhatri nullah.

From here onwards our journey of four days to the Hingol lay all the way by a track skirting the foot of the much-broken hill chain and within easy reach of the coast. At Khandewari, the first stage, the route passes the westernmost end of the long crescent-shaped inlet of the sea known as the Miani Hor, and a police post guarding a small fishing station. From here onwards it was interesting to note that the ground where it is not crossed by low sandstone ridges, the last offshoots of the hill range, is cut up into small trenches and terraces running regularly from approximately south-west to north-east, all cut by wind erosion just like *Yardangs* of the Lop Nor basin. Low sand hillocks crowned by tamarisk growth rising above level sandy ground added to this resemblance, though here the desolate look of the landscape was relieved by the picturesque forms of the ridges and cones rising on the crest of the much-worn hill chain.

Where the Phor river, dry at the time, debouches towards the sea between the parallel Hala and Haro hill ranges, there are to be found some fields cultivated by graziers, amidst plentiful tamarisks and other tree growth. But on the stretch of the route, close on 40 miles, covered between a well in the Phor river bed and the bank of the Hingol, water is to be found permanently only in a well at the deep-cut torrent bed of Sangal, and at the temporary grazing station at Munjawani to the east of it.

After passing through low rocky ridges we struck in the evening of February 3 the left bank of the wide bed of the Hingol river just above the small cultivated plateau of Aghor; its remains were visited some days later. Then crossing and recrossing the winding river bed where it makes a big loop round a conspicuous headland, we halted on a low level ridge forming its western extremity. From a large grazing area to the west of the river bend this usual halting place is known as Kunderach. In the morning there was a very impressive panoramic view from it of the fantastically bold and varied hill shapes crowning all the crests and spurs of the range through which the Hingol river has cut its way. The range is composed of white sandstone with

intervening thinner strata of calcareous sandstone. Its heights have been denuded into an endless succession of bold forms, resembling steeples, storeyed towers, turreted walls, and bastions. And it offered fascinating vistas wherever our way lay farther up the Hingol valley or across the ranges which join it.

Beyond the nearest of those spurs to the north-west there lay the side valley of the Hingol known as Hinglaj and holding the much-frequented Hindu pilgrimage place of the same name. It is the westernmost of Hindu *Tirthas* still "in being," and there was a special interest in visiting it as the name of the goddess, Mai Nani, to which it is sacred, indicates considerable antiquity of local worship. Crossing to the right bank of the Hingol and then after a short distance turning into the narrow side valley of Hinglaj to the west, one reached after some 4 miles a modern Sarai built by well-to-do Hindus of Karachi for the accommodation of pilgrims. The valley all the way up holds abundant tree growth and other vegetation by the side of the small stream which descends over its rocky bottom (Pl. 3). It thus presents a very pleasing contrast to the general aridity of the surrounding hill region. The attraction it thus offers also for animal life accounts for its having been made a shooting preserve by the last ruler of Las Bela.

Above the Sarai a steep path winding among large smooth-worn boulders ascends the left bank of the cascading rivulet for about a mile to the sacred spot. Under a high rock wall of sandstone on the right bank, slightly overhanging, there stands a little square stone structure of uncertain age. From it a narrow passage gives access to an oblong walled enclosure which forms the open air sanctuary. On a low platform in the middle there is raised a curious stone block, narrow in the middle and of globular shape at both ends, which by pious Hindu eyes is taken for a natural representation of the goddess Nani, apparently worshipped as a manifestation of Durga (Pl. 4). It obviously imparts to this sacred spot the character of a *svayam-bhu* or "self-created" Tirtha. Behind the head of the supposed image a low rectangular passage leads through what may have been partly a natural rift, but now is lined with rough masonry and roofed with timber. Pilgrims entering by the opening on the left and crawling on their knees through the passage at the back are thus able to perform the ritual *pradakshina*.

Muhammadan pilgrims who also visit Hinglaj take the stone block, which a carved railing bearing various sacred emblems surrounds, as marking the grave of a saintly wife of 'Ali, miraculously translated to this spot. For Muslims an aged Baluch who cultivates the fields at Aghor and who had there joined us, acts as *mujawir* or guardian of the sacred spot. The large batches of Hindu pilgrims are guided to Hinglaj all the way from Karachi by a duly recognized Purohita known as *Agowa*, who arranges for their transport and supplies. He collects from them the fees which are levied by the Las Bela administration and form a regular source of revenue to the State. Hindu pilgrims from different parts gather at Karachi at various times of the hot season and perform the journey by regular prescribed stages, including worship at a mud volcano called Chandragup near the coast between the Phor river and Sangal. It may be safely assumed that the rites, etc., connected with the pilgrimage are regulated as usual at Tirthas all over India

by a Sanskrit Mahatmya text; but I regret not to have been able to secure this or a meeting with the *Agowa* at Karachi.[1]

A confused mass of inscriptions, in a variety of Indian scripts and all of comparatively modern look, are found scratched or painted on a low portion of the rock wall below the shrine. They record the names of pilgrims but as far as we could see bear no dates, nor did we succeed in tracing any definite archaeological indications of antiquity. Yet there can be no reasonable doubts about local worship at the spot going back to a very early period. This is proved by the name Mai Nani, "mother Nani." As recognized long ago it unmistakably connects this local worship with the Chaldaean goddess Nana, widely venerated in Mesopotamia and beyond in the Middle East. The requisite proof of her worship in the borderlands between India and Iran is supplied by the appearance of her figure, and her name written in Greek characters as Nanaia, first on coins of an uncertain king of the Parthian period, and subsequently in the form of Nana or Nanaia on very numerous coins of the Kushan emperor Kanishka and his successors.[2]

Returning from Hinglaj on February 6 by a different route along the left bank of the Hingol I took occasion to examine the small site of Aghor near where the Hingol finally passes the outermost hills towards the sea coast. There a low plateau affords very limited ground for cultivation by means of an inundation channel taking off from the left bank of the river. On a small rocky ridge, rising above this flat ground by the steeply eroded bank, there is to be found plentiful broken pottery including enamelled fragments and decorated pieces resembling Chinese stoneware. These ceramic remains together with a number of much decayed *Rumi* tombs occupying the narrow top of another ridge eastwards, unmistakably indicate occupation of the site in mediaeval times.

This is confirmed also by similar ceramic debris lying on a third rocky eminence about 80 yards long which about 200 yards off the present bank rises island-like to some 40 feet above the wide river bed (Pl. 1). The branch of this separating the rocky knoll from the left bank was said to have been formed by the river within living memory. Judging from decayed walls of rough blocks of stone set in mortar on the slopes and the stone-lined mouth of a well on the top, the knoll appears to have served for defence. A Muhammadan copper coin picked up on it along with fragments of others left no doubt about the time of its occupation. The position of Aghor makes it appear likely that given very limited scope for cultivation afforded by the site, its occupation in mediaeval times served mainly such modest maritime trade as still proceeds from the coast up the Hingol to Jhau and adjacent parts of Makran and Jhalawan.

The impressions gained on the dreary marches to the Hingol of the ground between the foot of the hill range and the sea, with its very scant water and almost total want of resources, had led me increasingly to doubt whether this

[1] For some account of the practices observed at the pilgrimage and the graduated fees levied on it, see 'Las Bela Gazetteer,' pp. 35 *sqq*. There a reference will be found also to the account left by Captain Hart, the first European visitor to Hinglaj, 1840.

[2] See *e.g.* P. Gardner, 'Greek and Scythic Kings of India and Bactria,' pp. 119, 129, 1131 *sqq*.

route, passing towards the equally barren coast of the Ikhthyophagoi farther west, could ever have served for any large troop movement or caravan traffic between Las Bela and Makran. Yet it was just this route which has long been assumed to have served for the initial portion of Alexander's move from the territory of the Oreitai, *i.e.* Las Bela, into Gedrosia through Makran.[1] But there remained the wish to renew my acquaintance with the coast of the Fish-eaters touched by me before about Gwadar far away to the west, and subsequently to examine the route by which access to the eastern end of Makran could be gained up the valley of the Hingol.

With a view to this extension of my tour I turned first from the debouchement of the Hingol river towards the small port of Ormara, still included with the neighbouring strip of coast within the territorial limits of Las Bela. There was a special quasi-antiquarian inducement for me to pass through the rugged Malan range which, trending south-west from the last great bend of the Hingol near Hinglaj, runs down the coast and with its last outliers separates the great bay east of Ormara from the conspicuous headland of Ras Malan. This cape is duly recorded in the account of Nearchus' voyage with the name of *Malana*, marking the extreme western limit of the land of the Oreitai.[2]

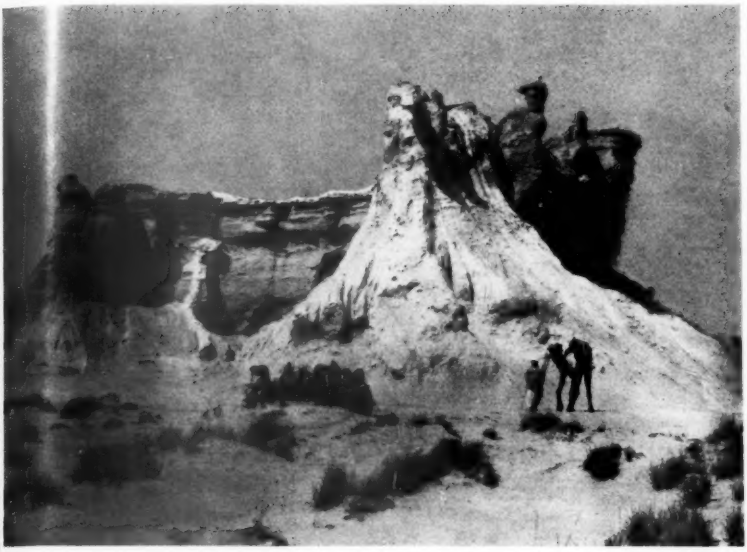
The name Malan is still borne by the small valley and grazing ground through which passes the more direct of the two routes from the Hingol to Ormara. The other route leads up a long bend of the Hingol river beyond Hinglaj, then turns into the side valley known as Hariani Kaur and from the head of this descends along the Maneji stream towards the eastern bay of Ormara. Though reported to me as less difficult it implies a considerable detour. I preferred to follow the route past Malan, be it only for the classical associations of its name and for the helpful guidance which the Indo-European Telegraph line, even in its now derelict condition, affords on ground much broken and often very deceptive.

After leaving Aghor and crossing to the right bank of the Hingol we reached on February 6 the open plateau of Kunderach, providing grazing for some nomadic Baluchi families and a pool of rain water in a dammed-up tank. From where our camp stood on a bare sandstone spur there was a striking panoramic view of boldly carved picturesque ridges and summits of white sandstone hills all around. On most of them a step-like series of intervening dark calcarous strata could be counted, all horizontally laid and marking a succession of geological periods when all these hill ranges had lain submerged in the Arabian Sea.

The arid desolation of the narrow ravines and steeply eroded valleys through which the descent south-west to Malan led, was relieved by distant glimpses of the sea and by striking hill formations suggesting bastioned castles, tall spires, etc. In the open basin of Malan furrowed by dry beds of torrents the eye was repeatedly deceived by isolated *mesas* recalling ruined

[1] See Holdich, "A retreat from India," p. 118; McCrindle, 'Invasion of India,' p. 168, for the conjectured derivation of the name of the Oreitai from *Aghor*, as a designation of the Hingol river; Cunningham, 'Ancient geography of India,' p. 353 (second edition).

[2] See Arrian, 'Indica,' 26 (ed. Robson, Loeb Library; also ed. Chantrie, Association Budé).



5. Peri Kalat near Ormara

6. Approach to Malan pass from east

7. Eroded sandstone hill, Hingol valley

8. Sandstone hill near Parkini river

structures and by column-like "witnesses." Small flocks of sheep and goats, grazing on scanty scrub near the rain pool where we halted, belonged to fisher folk living near the sea.

The ascent next day to the pass, about 1200 feet above sea-level, characteristically called Buzelak, "the goats' pass," led for a couple of miles in a winding cliff-lined ravine (Pl. 6) to the foot of a precipitous rock wall. Up this the narrow track climbs steeply along a narrow rift of the sandstone. Here a flight of steps has been cut into the slippery smooth surface of the rock for close on half a mile. It was this work of the late Indo-European Telegraph Department which has made this portion of the track just practicable for laden camels, though only with difficulty. That this pass could never have served, even when thus improved, for the movement of any large body of men encumbered with baggage, seemed certain.

From the pass flanked by high cliffs a descent less steep led down for some 8 miles through narrow gullies, encumbered with limestone debris, to a slightly wider valley holding some vegetation at its bottom and known as Gaz Ab. With a few rain pools at curves of the rocky slopes it serves as a usual halting place for whatever scanty traffic ever passes along this route.

On the following day a long march carried us down first to where the somewhat widening valley turns off to the south and where its occasional drainage makes its way to the sea. The track continuing to the south-west then took us across a low watershed called Sarbat where clumps of trees along a small stretch of gently sloping ground marked what appeared to be a patch of abandoned cultivation. Owing to the want of adequate guidance at the time it was only later after leaving Ormara for the Hingol that I learned of the side valley above Sarbat holding the remains of a *Gabar-band*. Thus are called locally those ancient ruined barrages which at numerous places of Makran and Jhalawan indicate permanent occupation during prehistoric times.[1] Nowhere else on my tour through Las Bela did I learn of the existence of any of these interesting indications of early irrigation. They have a certain bearing on the question of climatic change or desiccation affecting parts of Gedrosia since a prehistoric period.

Descending very steeply from Sarbat the track took us into a perfect maze of narrow, deeply eroded ravines where but for the guidance afforded by the broken poles and trailing wires of the *quondam* Indo-European Telegraph line it would have been easy often to lose the direction. So it was with relief that at last after ascending steeply to a narrow knife-like arête of sandstone under high cliffs a distant view was caught of the sea and of a glacis sloping down towards it. But for stair-like steps cut into the smooth-worn sandstone the descent into a gorge on the other side would have been impossible even for unladen camels.

On the wide scrub-covered glacis beyond, furrowed by dry torrent beds, no halt could be made until late in the evening when a small grove of palms by the side of a dammed-up pool of rain water was reached. Next day a long weary march over a scrubby plain took us past another small clump of trees by the side of a muddy tank to the shallow terminal bed of the Maneji stream.

[1] See Stein, 'An archaeological tour in Gedrosia,' pp. 7, 24 *sq.*, 45, and *passim* (as noted in Index).

Thence marching along the dune-lined foreshore of the great curving bay we gained after nightfall the little port of Ormara.

The village of Ormara is situated on the eastern shore of a flat narrow isthmus terminated on the south by a bold headland rising to some 1500 feet above the sea. The majority of the population reckoned at about two thousand five hundred souls consists of Meds, fishing folk carrying on the traditional occupation of their ancestors. They have developed, probably under Arab influence since early mediaeval times, into capable seafaring people and are now accustomed to sail their boats for trade with cured fish as far as Colombo and Zanzibar.

But their ways of life like the mat huts which serve for their dwellings, and the methods used in their main occupation of catching and curing fish, can have changed little since ancient times. But it was interesting to note that to this livelihood is added for Ormara the import, from the side of Makran and Jhalawan, of grain stuffs needed by the rest of the local population, and the export of dates and the widely used matting of leaves of the dwarf palm, brought down from the nearest valleys to the north.

Considering the very scanty economic resources and the thinness of the population in the whole of this coastal tract, estimated in 1921 at about five thousand six hundred souls along a stretch of coast not less than some 120 miles in length, I could not feel surprise that my stay of three days at Ormara needed to give rest to men and beasts, did not reveal remains of antiquity. Ormara has in all probability rightly been identified with Bagisara, which Nearchus mentions as a place having a good anchorage.[1] By sailing round the picturesque cliff-lined shore of the headland I was able to visit, near its south-western extremity, the glen of Mogal where ground of former cultivation was reported. After landing in a small cove, quite romantic in appearance, and ascending a narrow ravine we were shown the spot where under an overhanging rock face fresh water can always be found by digging down a few feet into the sandy soil. Then after ascending for close on a mile along limestone ledges we arrived where the head of the valley widens into a small alluvial plain. Decayed embankments meant to hold up rain water on terraced fields could be clearly traced here, but no distinct signs of ancient cultivation.[2]

Before leaving Ormara I paid on February 14 a visit to another locality reported as old and known as Peri Kalat, "the castle of fairies." On starting for it from the former Telegraph station which now serves as Rest House, I took my way through the twisting Bazaar lane of Ormara, infested like the

[1] See Arrian, 'Indica,' 26, 3. The village of Pasira mentioned in the same passage as 60 stades distant from Bagisara, may be located at the present Had, about 7 miles north of Ormara, which the 'Gazetteer,' p. 193, names as the only permanently occupied of the seven main villages of the Ormara Niabat.

[2] It is likely that the mouth of the Mogal valley is meant where Arrian, 'Indica,' 26, 4, tells us that the fleet on leaving Bagisara "weighed anchor earlier than usual and sailed round a promontory which ran far seaward, and was high and precipitous. Then they dug wells and obtained only a little water, and that poor; and that day they rode at anchor, because there was heavy surf on the beach." The description of the promontory here found agrees closely with the shape of the Ormara headland. To circumnavigate it from Ormara village to Mogal means a sailing distance of at least 15–16 miles.

rest of the village with swarms of flies and insects and the all-pervading smell of fish-curing. Beyond a large rain pool, near the outlying mat huts of fishing folk, the route over the narrow scrub-covered isthmus lay to the north-west past a long line of low mesas, all running from south-west to north-east and showing the erosive effect of the prevailing winds.

After some 7 miles there was reached the conspicuous isolated mesa which from its striking resemblance to a turreted castle bears the name of Peri Kalat (Pl. 5). It rises with extremely steep, in most places almost vertical, walls of sandstone to a fairly level top at a height of about 80 feet. Judging from the total absence of ceramic debris this naturally strong position appears never to have served for permanent occupation. A low limestone ridge however not far from its northern foot bears numerous graves of an old burial ground locally ascribed to the Zikri sect among the Ormara population.

It had been my intention from the start after visiting Ormara to make my way up the Hingol in order to reach Jhau, a cultivated portion of the Hingol valley which lies on the nearest route from Las Bela to Makran. But instead of returning for this purpose first to the mouth of the Hingol, thence ascending in the much-winding valley with all its bends, it appeared to me on a study of the Survey of India map (sheets Nos. 35 C and 35 G) advisable to move from Ormara north-eastwards, to cross the Taloi range into the valley of the Parkini, a considerable western tributary of the Hingol, and to follow this down to near its junction with the Hingol, some 50 miles above Aghor. Thus a great detour of at least six marches could be avoided. There was a special reason for me to decide on this route to the Hingol as it would give me an opportunity of gaining personal acquaintance with the Parkini valley through which, according to a theory set forth by Sir Thomas Holdich, Alexander's route into Gedrosia had lain.[1] To this theory I shall have occasion to recur further on when discussing the classical records regarding the route.

It was hence reassuring to me to learn after my arrival at Ormara that the proposed route was known to local informants as regularly used by small caravans bringing supplies of food, grain, and dates from Jhau. Still more welcome it was that with the help of the obliging Naib of Ormara I was able to secure a reliable and very intelligent guide to Jhau in the person of Ali Murad, a former guard on the Indo-European Telegraph line and familiar with the ground as a hunter.

Starting from Ormara on February 15 we moved first along the shore of the eastern bay of Ormara to the terminal bed of the Maneji river, then over an utterly bare peneplain to the north-east, and after some 23 miles' march reached a rain pool in a deep-cut dry torrent bed. Next day another long march continued in the same direction took us first past two very small patches of ground to which embankments secure flood water for cultivation. It is carried on by graziers temporarily occupying this ground known as Gorad. Then the track, difficult to follow without a guide, passed across and

[1] Sir Thomas Holdich, "A retreat from India," pp. 112 *sqq*. The volume containing this proved difficult to secure in any public library in India within my reach. Apart from the abstract to be found in the 'Las Bela Gazetteer,' p. 19, it became accessible to me only later through a typed copy which Major Drewett, Secretary of the U.S. Institution, India, had the kindness to get made for me from the single copy of the volume available in its Library.

along a desolate arid waste formed by a succession of low outer hills, chiefly composed of much decayed limestone, until water was found in a rain pool left in a bed below a high ridge descending from the Taloi range.

From this halting place which from a sulphur spring passed higher up is called Shorkul Chakuli, the route, difficult but just practicable for laden camels, led through narrow winding gorges northward across the Taloi range. This divides here the Parkini river valley from the valleys draining to the sea. After several minor ascents and descents in rubble-filled ravines the watershed was reached at an elevation of about 1200 feet. Then a somewhat easier descent in a stony gorge led down into the Parkini valley. To my pleasant surprise I found a shallow but continuous stream flowing down its bottom, or else, after stretches where rubble covers the surface, reappearing again and again in a succession of large pools holding sheets of limpid water. With patches of tree growth here and there by the side of the stream the Parkini valley provided a very pleasant contrast to the arid wilderness of the ranges which bound it on both sides (Pl. 8). As we descended along the river with its many long bends bold peaks showed on the crest of the southern range.

We halted near a large pool at a spot which Ali Murad our guide knew by the name of Nanani Benth. On February 18 our route continued down the valley keeping by the Parkini river except where its great bends were avoided by cutting across low stony plateaus. At a particularly long loop of the river the route left its course altogether and ascended steeply by a rift to a broad saddle. This at some 200 feet above the river gave access to a small plateau from which through a maze of eroded terraces the Parkini bed was regained. Finally after following the Parkini down, there was reached the point, known to our guide as Langar Dap. There after passing a number of other narrow side nullahs to the north, he was able to recognize the mouth of the one through which we could make our way to the Hingol by a short cut, instead of having to descend its much-winding tributary down to the junction a long distance ahead.

Before leaving the Parkini valley I may note that though it offers throughout some grazing for camels and flocks as well as plentiful water for men and animals to drink, even at the late season of our passage, no graziers' camps were met in it nor any evidence of its having ever seen permanent occupation. These observations deserve to be kept in view when discussing Alexander's route from the territory of the Oreitai, *i.e.* Las Bela, into Gedrosia. In the light of the Greek notices they cannot be reconciled with the theory which assumes Alexander's march to have led from the lower course of the Hingol up the Parkini valley (see p. 219).

The ascent to the Langar Lak which saved the great detour down the Parkini valley, led through wildly fissured ravines to a narrow saddle, marking the watershed between the Parkini and the Soler stream, another western affluent of the Hingol. Though its elevation was only about 900 feet, yet the difficulty of the track (Pl. 9) served to give some idea of the obstacles which, farther west, the wide belt of successive narrow ranges running north of and parallel to the Coastal Range must present to any direct communication between the coast and the open main tracts of Makran along the line of the

Kolwa and Kech valleys. We shall see that this consideration also has its bearing on the question of Alexander's route.

It is different with the route which the Hingol river by cutting its way right across this string of ranges has opened for traffic between the coast and the eastern extremity of Makran. We struck this route at Soler Dap, the junction of the Soler stream and the Hingol, and thence followed it all the way up to Jhau. For the first two marches on February 20–21, the valley of the Hingol winding with many bends in a general N.N.E. direction offered easy progress (Pl. 7). The river flowing rapidly in a shallow stony bed, mostly 20–30 yards broad, was crossed again and again between low terraces. On one of these before reaching our first halting place known as Bundi we came upon recently cultivated fields.

Evidence of regular occupation in the shape of graziers' shelters and small patches of cultivation increased as we proceeded next day up to the plateau-like ground of Fau. There a stream coming from Awaran meets the main feeder of the Hingol. This is known farther up as the river of Nal from the fertile tract of Jhalawan where it rises. The track leading to the Awaran stream was reported as impracticable for laden traffic. But Kolwa, the easternmost of the open cultivated valleys of British Makran, is reached by an easy route leading westwards from Fau.

Beyond Fau our camp stood at Mulla Benth, a pleasantly wooded spot with some fields situated under frowning cliffs above the Nal river. From there a long and rather trying march was still to be made before the open valley plain of Jhau, my immediate goal, could be reached. For some 10 miles the track lay across fairly open ground above the river bed with a few fields cultivated by people from Jhau and offering impressive vistas towards bold peaks of the Dhrum massif eastwards. But a few miles farther up the river was seen to pass into very narrow cliff-lined gorges declared to be impassable even on foot. So the track from Garbe-rangan, "the defile of Garbe," to avoid these gorges turned up very steeply to a succession of high and much-broken ridges. For close on 7 miles three distinct *Laks* or passes had to be crossed. The ascent in each case lay through a maze of narrow twisting ravines so narrow in places as to leave barely room for the passage of the laden camels. Apart from a small rain pool, found already occupied by a party from Jhau, neither water nor grazing was passed until the deep-cut bed of the Nal river was again approached by nightfall.

Next day a long but far easier march carried us to the lower village of Jhau. A couple of miles more over low hills overlooking the left bank of the Nal river sufficed to bring us to the fields of Gausho Kalat, a small outlying hamlet at the entrance of a steadily widening valley plain. Proceeding over this open scrub-covered ground there were found on two low rocky ridges rising near the bank of the river abundant remains in the shape of potsherds and decayed walls marking prolonged occupation, probably in early historical times. Close to both these sites, known as Bausho Kalat and Gurguro Damb, there were found patches of irrigated land though no present habitations.

Then beyond the second of these sites we entered a broad jungle belt with luxuriant tree growth, abundantly watered from flood beds of the river. From its upper end more or less continuous cultivation with scattered hamlets

was found to extend for 6 miles to where we halted at Shahr Kalat, the lowest of the main villages of Jhau. This tract of Jhalawan with which I had before become acquainted on my Makran tour of 1928–29, comprises a long stretch of fertile alluvial ground along the valley of the Nal river, here nowhere less than about 3 miles wide at its bottom.

Irrigation from rain floods and from the perennial flow of "black water" which a portion of the Nal river holds owing to the presence of springs accounts for only a small portion of the cultivation carried on at present in the Jhau tract. Most of this cultivation depends on the scanty and irregular rainfall, and this explains why in spite of the great extent of potentially arable land, the last census (1921) for which figures are accessible to me showed for Jhau a population of only about six thousand one hundred souls. Yet the existence in ancient times of much greater economic resources is strikingly proved by the considerable number and large size of the ancient mounds which I had been able to survey here on my previous visit. The evidence then collected in the shape of their ceramic and other remains had conclusively proved prolonged occupation of the Jhau tract in Chalcolithic times and by a population which must greatly have exceeded the present ('Archaeological tour in Gedrosia,' pp. 133 *sqq.*).

The renewed visits I was now able to pay to these mounds, in the course of the next three days, mainly from the upper portion of the tract known as Lanjar, greatly helped to confirm this impression. With this fully agreed also what the survey made in 1929, of a series of other ancient sites in the Nundara and Awaran valleys closely adjoining the Jhau tract on the north, had shown as to the economic resources which this ground on the confines of Makran had presented also within historical times. All this led me now to turn with increased interest to the direct route connecting Jhau with Las Bela, its immediate neighbour to the south.

All local information collected during my renewed stay in Jhau pointed clearly to the importance with which unchanging geographical facts must at all times have invested that route as the most convenient line of communication from Sind and Las Bela to Makran for trade as well as for all other movements. It was thus of special interest for me to learn that this route was in regular use for imports into Makran and adjacent parts of the Kalat State of goods from the port of Karachi and Sind, and equally also for the export to Las Bela of agricultural products. Among such figure largely the excellent dates plentifully grown in Panjgur and elsewhere in Makran and also such grain stuffs as the surplus of spring crops in Jhau and Kolwa, when favoured by the winter rainfall of these parts, allows to be brought down to Las Bela at a season while the crops of the latter dependent on the monsoon rains are not yet available. It is in this respect, as may be noted in passing, that the difference in climatic conditions between Las Bela and the hill tracts in the interior, to which the monsoon current does not penetrate owing to the intervening ranges, makes itself markedly felt.

It was evident that the conditions just indicated, especially as regards the presence of local supplies at Jhau and the regular intercourse thence maintained with Las Bela, deserved full consideration in connection with the question as to the route likely to have been followed by Alexander for his

move into Makran. But there still remained personal acquaintance to be gained with the character of this route, and in particular in respect of its practicability for a large body of troops and their impedimenta.

Consideration of the excavation work planned at Las Bela and also for the approaching heat to be expected there made it advisable not to delay my departure for Las Bela too long. So our journey towards Las Bela was started on February 26 from where the caravan route from Awaran debouches into the central portion of Jhau. The journey to Bela is usually reckoned at three marches. But the need of examining on the way the mound of Sistegan Damb near the main village of Lanjar which before had escaped me, caused our journey to be done in four stages. That mound in question proved by its surface finds to mark a site occupied down to late prehistoric or possibly historical times.

Proceeding thence to the well-marked caravan track towards Las Bela we passed after a couple of miles within sight of the great mound of Siah Damb, "the black mound," the largest of all Jhau sites. It occupies a low plateau above a bed of the Nal river near where springs rising in it provide a perennial flow of "black water" for some distance. From here onwards this and the next two marches led in an almost straight line to the south-east across a bare stony upland furrowed by a succession of flood-beds all draining south into the Hingol. The wide open peneplain afforded easy progress for some 22 miles, the fairly flat stony surface being broken only in a few places by much decayed narrow ridges of sandstone which wheeled traffic might cross without difficulty.

Large rain pools found in the torrent beds of Lanadere and Washapi afforded convenient halting places at the end of the first two stages. Scanty scrub to be found in the dry beds provides some grazing for camels and other transport animals. Again and again on moving along this route to Las Bela there were met parties, large or small, of Makrani people who had made their annual winter migration down to Karachi and Sind in search of work. Now, on the approach of the hot weather, they were making their way back to their homes with their wives, children, and scanty belongings mounted on donkeys and other animals in which they had invested portions of their savings.

From the Washapi bed a third march took us over a small pass at an elevation of some 1400 feet past bold limestone formations to a wide flat plateau traversed by the Mar Kaur, a considerable drainage bed; finally it led into a basin visited by graziers from the side of Las Bela. There small water-holes in the ravine of Wadana permitted a halt. All the way the increasing heat on this bare upland had made itself tryingly felt.

On March 1 a last and interesting march of some 16 miles carried us first to the eastern edge of these barren uplands and then down through picturesque gorges to the alluvial flat of Las Bela. After we had passed over open ground to a large pool known as Pir Kumbh and marked by a saint's tomb,[1] as usually found on much-frequented passes of these parts, a short and gentle descent brought us to the point where a customs post, collecting transit dues on behalf of the Kalat State, marks the border of Jhalawan towards Las Bela.

[1] For a legend connecting this tomb with the story of Farhad and Shirin, see 'Las Bela Gazetteer,' pp. 43 *sq*.

Immediately beyond there commences the descent eastwards along a spur of soft sandstone (Pl. 11). The traffic of ages has cut into this a serpentine track down to the bottom of a narrow ravine some 300 feet lower. The track, about 2 yards wide, though steep, is perfectly safe for laden camels. Owing to the absence of any hard rock it would not need much labour to make it practicable for horse-drawn or man-handled carts.

Once the bottom of the ravine is gained, progress lies all the way down at an easy gradient along the steadily widening bed of a nullah (Pl. 12). Though plenty of rubble fills the bed and the track twists in places round heaps of large blocks of rock, rolled down from high cliffs on either side, the track offers no serious obstacles to laden traffic at any time except when heavy monsoon rain brings down a spate. The nullah descends in a winding course of some 7 miles to its mouth, an elevation of about 400 feet above sea-level. It presents no greater difficulties for a rough cart or motor track being made than those met and overcome on many routes through the hills of the Indian North-West Frontier, the Khyber included.

Where the mouth of the valley, at a point known as Danth, opens out into a gently sloping fan bearing tree growth there was passed near some water-holes the position of the former Las Bela customs station. Farther down I noted the line marked for a motor track of the Las Bela ruler and finally arrived at cultivated ground near the huts and well of Naku, the present customs post.

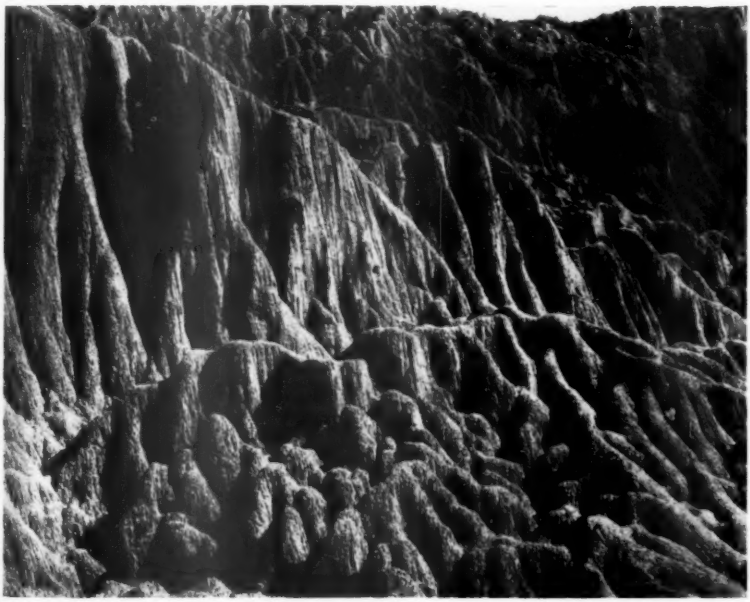
From here a short march across the flat alluvial plain, intersected first by flood beds of the Kud river and then branches of the Porali, would have sufficed to bring us to Bela. Actually our onward journey did not lead there but to the north along the Kud river to Gundarani at the foot of the range where the archaeological interest of that curious troglodyte site called us. The observations made there and those later at the prehistoric mound of Buband, within the village tract of Welpat, on our way to Bela town may be left for record elsewhere.

Section 3

Having sketched above in brief outlines the chief geographical features of the territory of Las Bela and described what personal acquaintance gained on my tour allowed me to observe of certain of its main portions, I may now proceed to examine what light the record of Alexander's operations in this territory receive from knowledge of their scene. These operations may claim some special interest because they marked the last phase of Alexander's invasion of India; but even more on account of their being closely connected with that famous retreat of Alexander's army through Gedrosia which by its hazardous nature and the great losses and sufferings it involved has exercised the imagination both of his contemporaries and of later historians.

It cannot be a subject of this paper to deal in detail with all the circumstances which led to this bold enterprise. But some remarks here seem needed on the circumstances which may explain its having been undertaken, and account for the line chosen for its execution. It has long ago been recognized that geographical exploration was among Alexander's chief objects when he

9. Langar pass between Parkini and Soler rivers



10. Sandstone along Hingol river

11. Hills to west of Kumbh pass on route from Las Bela to Jhau

12. On way up to Kumbh pass towards Jhau

moved with a large portion of his army from the Panjab to the mouth of the Indus. One main portion of this task of discovery was served by the voyages which took the great conqueror from Pattala at the head of the Indus delta, down both main branches of the Indus in succession, to the Indian Ocean (Arrian, 'Anabasis,' 6, xix–xx). Then at the base established at Pattala [1] preparations were made for the fleet commanded by Nearchus to accomplish the other task of discovery by sailing along the Arabian Sea coast to the Persian Gulf with a portion of the army on board and ultimately to convey it to the mouth of the Euphrates and Tigris. Already before the final descent along the Indus Alexander had detached Craterus with a large part of the army and all the elephants "to go by the road of the Arachosians (the Helmand valley) and Zarangions (Sistan) to Carmania (Karman)," where he was ultimately to rejoin Alexander.[2]

Arrian tells us at some length that while Nearchus with the fleet was still awaiting at Pattala in the autumn (of 325 B.C.) the advent of the north-east monsoon, which would provide the season favourable for coastal navigation, Alexander set out from Pattala with his remaining considerable force, largely composed of mounted troops. "He turned towards the ocean keeping it on his left in order to dig wells so that there might be plenty of water for the army which was sailing along the coast, and also with the intention of making a surprise attack on the Oreitai, the Indian tribe in these parts who had long been independent, since they had failed to make any friendly overtures to Alexander and his troops" ('Anabasis,' 6, xxi, 3).

On his advance "he crossed the Arabius, a narrow river with a small stream, traversed a considerable part of the desert by night, and at dawn was close to the inhabited region. Here he ordered the infantry to follow in marching order, but the cavalry he took with him and divided into squadrons that they might cover the greatest extent of country, and thus invaded the territory of the Oreitai. Such of them as offered resistance were cut down by the cavalry and many were captured alive" ('Anabasis,' 6, xxi, 5).

It should have been recognized long ago that by the Arabius the Hab river is meant here and quite correctly described. It drains the valley now known as the "Levy tract" between the southernmost hills of the Kirthar range and now forms the boundary between the flat south-western extremity of Sind about Karachi and the Las Bela State, just as it divided the territory of the Arabitai "an independent tribe who dwelt about the river Arabius" from the Oreitai, their neighbours to the west. It agrees with this identification of the Arabius as the Hab river that the Arabitai, when they learned of Alexander's approach, fled into the desert, *i.e.* into their hills northward ('Anabasis,' 6, xxi, 4). It is made equally clear by a look at the map that by the "considerable part of the desert" which the force traversed by night, is meant the barren much-broken plateau which the present high road from Karachi passes for a distance of some 20 miles between the Hab river and the

[1] The position of Pattala may be looked for probably in the vicinity of Haiderabad, but remains to be definitely fixed; for a summary of various locations, see *e.g.* McCrindle, 'Invasion of India,' pp. 356 *sq.*

[2] Arrian, 'Anabasis,' 6, xvii, 3. Here and elsewhere in quoting Arrian, Robson's translation in the Loeb Classical Library edition, 1933, is reproduced.

flat and potentially fertile ground by the coast south-east of Sonmiani, as far as the station of Naka Kharari.[1]

After having sent his cavalry ahead to sweep the country in a separate detachment, we are next told that "for the time being then, Alexander encamped by a small (sheet of) water; but on being joined by Hephaistion and his troops he advanced further." On consulting the map once again it is easy to see that "the water not large" of Arrian's text, where Alexander encamped to await the arrival of the main force under Hephaistion's command, is most likely to correspond to the Siranda lake which is skirted by the direct route leading to Bela and the best cultivated portion of the Las Bela territory. It receives most of the terminal drainage of the Porali and its lowest tributaries from the hills. It holds a perennial supply of drinkable water amply sufficient for the needs of a large force during some halt such as Alexander's main troops must have needed.

From the Hab river they had covered a total marching distance which could not have been less than about 50 miles, and that partly over much-broken waterless ground. Such a halt would then also have allowed the detached columns of cavalry scouring the country of the Oreitai to rejoin. It deserves to be noted that though the route to the Siranda lake from Naka Kharari passes along grazing grounds with plentiful tree growth, yet water is found only in scattered wells. The Windar, the only drainage bed crossed *en route*, is dry except when carrying rain floods during the monsoon.

Before we follow further Arrian's brief account of Alexander's movements in the country of the Oreitai, note must be taken of some useful indications with which the records of Curtius and Diodorus supplement that account at this point. By Curtius we are told that Alexander after parting from the fleet on the Indus passed through the tracts of the Arabites and Cedrosu and arrived at the river called by the natives Arabius. "Beyond it the country was found desert and waterless. This he traversed and so entered the land of the Horitae. There he handed over the greater part of the army to Hephaistion and divided (the rest of it consisting of) light armed troops between Ptolemy, Leonnatus and himself. These three divisions plundered the Indians simultaneously and carried off a large booty. Ptolemy devastated the maritime country, while the king and Leonnatus between them ravaged all the interior. Here, too, he built a city in which he settled Arachasians."[2]

[1] Sir Thomas Holdich, "A retreat from India," p. 116, takes the Arabius for the Porali, as before also Cunningham, 'Ancient geography of India,' p. 350 (second edition), and assumes for the crossing of the river a position south of Bela. But Arrian's text clearly shows that a considerable stretch of desert was crossed after passing the Arabius river and before the attack on the Oreitai was made. Once beyond the Porali no such desert would be crossed. The mistaken identification of the Arabius with the Porali by Holdich is connected with his conjectured assumption that the sea in Alexander's time extended much farther north than at present, at least as far as Liari, more than 20 miles north of the port of Sonmiani. This theory has materially influenced the whole of Sir Thomas Holdich's views regarding the route followed by Alexander on his move from Las Bela into Gedrosia. It is not supported by any valid archaeological evidence.

[2] Curtius, 'Historiae' (ed. Heinicke) 8, x, 5–7. I give the passage as translated by McCrindle, 'Invasion,' p. 262, with slight modifications as suggested by the wording of the text. It seems difficult to account for the total of the twenty-three days which

The information here given is confirmed in its essential details by Diodorus who evidently used the identical source in a passage which specifies a topographically interesting point. "Then after passing through an extensive waterless tract, of which no inconsiderable part was desert, he reached the border of the Oreitai. There he divided his army into three parts, giving Ptolemy the command of the first division, and Leonnatus of the second. Ptolemy being commanded to ravage and plunder the seaboard and Leonnatus the interior, while the third division under his own command, devastated the plains towards the hills and the hill country itself." [1]

Here we have then a definite indication that the direction of Alexander's advance within the territory of the Oreitai lay towards the north, *i.e.* that portion of Las Bela where the fertile plain lies nearest to the hills, and where, as we have seen, the facilities of irrigation from the Porali river and thence for settled occupation are the greatest. It is thus to this area, the present Welpat tract at the apex of the triangular alluvial fan, that we have to look for the site to which Arrian's account next takes us. There we read that "on being joined by Hephaistion and his troops he advanced further. Then arriving at a village which was the largest village of the Oreitai, called Rambakia, he was impressed with the position, and felt that a city founded there would become great and prosperous, he left behind Hephaistion, therefore, to attend to this" ('Anabasis,' 6, xxi, 5).

It follows from what has been explained above that the site of the village of Rambakia which Alexander selected for founding a city, has to be looked for in Welpat and with some probability in the vicinity of the present Bela. But no definite location is at present possible. At Bela itself the height and extent of the mound on which the town is built, distinctly suggests considerable antiquity, and the traditional belief that Bela represents the Armabel of Muhammadan historians, mentioned as on the route followed by Arab invasions from Makran into Sind, points to the occupation of the site anyhow since early mediaeval times. But I was unable to trace any definite archaeological evidence as to the earliest period to which the formation of the great mound may date back. Continued occupation down to the present day with its constant deposit of refuse on the slopes has prevented here such denudation as might have exposed on the surface ceramic and other approximately datable remains.

It is different with two other conspicuous old mounds which rise above the alluvial plain in the neighbourhood and undoubtedly mark important sites of antiquity. Both will be found fully described in the purely archaeological section of the report on my tour in Las Bela. Of the mound of Niai Buthi,

Alexander is stated by Curtius to have spent on his move from the Indus to the Arabius, considering that the marching distance between those points, as measured along the line followed by the N.W. Railway from Haiderabad (assuming this to be position of Pattala) to Karachi and thence to the Hab river cannot well be reckoned at more than about 150 miles. The three tracts here indicated in their order from south to north may be considered roughly to correspond to the present Niabats of Sonmiani, Sheh-Liari and Uthal, and Welpat. Judging from the amount of booty recorded by Diodorus as having been gathered in these tracts they may be supposed to have held a larger population than is to be found there nowadays.

[1] Diodorus, 'Bibliotheca,' 27, civ, 5 *sq.*; McCrindle, 'Invasion,' pp. 296 *sq.*

situated about 3 miles in a direct line to the north-east of Bela, our trial excavation has shown that it dates from Chalcolithic times, and no evidence of later occupation was traced. In the case of the other mound which rises about half-way to the former in the same direction and close to the much-frequented sacred tomb of Pir Kariya, plentiful pieces of decorated pottery found on the surface prove occupation during early historical times. Some Sassanian silver coins shown to me by the Jam Sahib are also said to have been found on this mound. The ground around both mounds is crossed by numerous inundation channels from the Porali and flood beds draining the hills to the east, and it is closely cultivated throughout.

The name Rambakia given by Arrian for the "capital" of the Oreitai affords no help to its location. There is no local name in Las Bela which can be derived from it. Its interpretation as the equivalent of a conjectured modern Hindi Ram-bagh, as suggested by General Cunningham,[1] on the ground of a supposed connection with the distant Hindu pilgrimage route to Hinglaj on the Hingol, is not supported by any philological or other evidence and only an instance of "learned popular etymology." Nor can any archaeological support be found for the location of Rambakia at Khaira Kot far away to the south as conjectured with some hesitation by Sir Thomas Holdich, the site being certainly mediaeval.

'Arrian next tells us that Alexander leaving Hephaistion behind at Rambakia to attend to the foundation of the proposed city, with a mounted portion of his force "advanced towards the border of the Gedrosians and Oreitai, where it was reported that the approach was by a defile (στενή) (Pl. 12) and the Gedrosians and the Oreitai had joined together and were encamped before the gorges (πρὸ τῶν στενῶν) to check Alexander's approach. They were, in fact, arrayed there; but when news was brought that he was nearing them, the greater part of them fled from the gorges (ἐκ τῶν στενῶν) deserting their post; but the chiefs of the Oreitai came to Alexander surrendering themselves and their nation" ('Anabasis,' 6, xxii, 1 *sq.*).

There then, in Arrian's concise narrative, as always critically more reliable than the notices of Alexander's other historians, we have a definite topographical indication as to where Alexander's route lay when he crossed the border from the land of the Oreitai into Gedrosia. It was the same border which divides now the present Las Bela from the Kalat State in the mountains west of Bela (Pl. 11). After what has been shown above as to the line followed on his advance from the Hab river northward to "the largest village of the Oreitai," in the vicinity of Bela, the present capital of Las Bela, there can be no reasonable doubt that by the defile towards which his advance then lay and by the gorges at the mouth of which the combined tribes were arrayed to stop it, is meant the pass to which the present main caravan route, connecting Las Bela with the Jhau tract and thence with the eastern extremity of Makran, ascends through winding gorges from the alluvial plain west of Bela.

It is easily understood also that the Oreitai, whose territory had already been ravaged before by the several Macedonian columns, should have fled, towards that route which could afford them the nearest line of retreat, to a

[1] See 'Ancient geography of India,' pp. 354 *sq.* (second edition).

neighbouring tract where they could hope to find protection and, what in case of such an emergency would be of equal importance to large numbers of fugitives, needful means of subsistence. They could not possibly have sought these in the south along the barren sea coast or help for resistance from the poor "fish-eaters" living along it. The quick submission of the fugitive Oreitai, when the invader drew near them on this route, proves that by his sudden attack on "the Oreitai the Indian tribe in these parts who had long been independent" ('Anabasis,' 6, xxi, 3), Alexander had produced the intended effect and cleared the way for his subsequent unopposed march through Gedrosia. That he encountered no resistance on this may well have been, at least partly, a result of this initial success.

Arrian next relates that Alexander left Leonnatus behind with detachments of the army to "await the fleet, until it made its voyage past the district, to build the city" and to pacify the territory. "Then he himself with the larger part of his army . . . proceeded towards the Gedrosians through country which for the most part was desert" ('Anabasis,' 6, xxii, 3).

Before we proceed to trace Alexander's move farther through the wastes of Gedrosia, be it only in briefest outlines, reference must be made here to two questions. They relate to the choice of this route which was to entail such grave trials and losses to his army, and to the difficulty about supplies that was their chief cause. As regards the direction of the route followed, a look at any convenient small-scale map[1] shows that if access was to be gained from the Indus delta and Las Bela to the important provinces of Kerman and Fars, the ancient Carmania and Persis, main portions of Alexander's newly conquered vast empire, no line of march more direct could have been chosen than the one presently to be sketched.

In respect of the chief difficulty presented by this route to the passage of an army, Arrian has fortunately preserved for us the following information which on account of the authority quoted for it must claim special interest and importance: "It was not because Alexander had no knowledge of the difficulty of the route that he went that way (it is Nearchus alone who says so); but rather that he had heard that no one had successfully come through this way with an army, except that Semiramis had fled this way from India. The natives had a tradition that even she escaped only with twenty of her whole force. Cyrus, son of Cambyses, had got through with only seven survivors. For Cyrus had come into these parts intending to invade the country of India; but before he could do so he lost the greater part of his army by the barrenness and difficulty of this route. The relations of these stories to Alexander inspired him with emulation towards Cyrus and Semiramis. It was then, on this account, and also that the fleet, being close by might be provided with the necessaries, that, according to Nearchus, Alexander chose this route." [2]

[1] See, *e.g.* the Baluchistan and Southern Persia sheets, 32 miles to 1 inch, of the 'Southern Asia Series' of the Survey of India.

[2] Arrian, 'Anabasis,' 6, xxiv, 2 *sq.* In the concluding sentence the reference to the supply of necessaries to the fleet has been rendered differently from Robson's translation in view of what Arrian records, 6, xxiii, 4–5, about Alexander's endeavours to keep the fleet supplied with such provisions as might be collected in places along the march; see also McCrindle, 'Invasion,' p. 173.

In Book 6, Arrian has related at length the manifold great sufferings which Alexander's army underwent on its distressing progress from the land of the Oreitai to Pura, the chief place of Gedrosia. He has also graphically described a number of particular incidents. The want of local resources, the scarcity of water with the consequent enforced length of trying marches, the heat of the barren region and the rapid loss of transport animals due to these causes; all these are emphasized also by the other historians of Alexander. The difficulties of this retreat were increased also by the large number of women and children which accompanied the army.

In those accounts we find the trials and losses undergone by the troops all described with ample detail, often rhetorically treated. By the side of these elaborate details we note a striking absence of precise topographical indications. Yet the configuration and the general character of the ground over the vast stretch of Baluchistan between the confines of Sind and of Kerman, as we now know it, make it quite clear that the line followed by the bulk of the army must have lain from Jhau on the upper Hingol river along the natural corridor, formed by the open basins of Kolwa and the wide Kech-Dasht valley, towards the valleys drained by the streams of Sarbaz and Qasrkand. Thence the great basin receiving the waters of the Bampur and Halil rivers lay open. Through this the fertile valley of Jiruft and the great cultivated tracts of the Kerman province, both to the north and west, could be reached with comparative ease.

My journeys of 1928–29 and 1931–32 have enabled me to visit and survey most of those portions of British and Persian Makran through which the route followed by Alexander's army is likely to have led. The full account of the observations, archaeological and geographical, made by me on these journeys, as contained in my detailed reports,[1] sufficiently illustrates the physical difficulties which were bound greatly to hamper the movements of any large force crossing this great stretch of ground. Most of it is desert now just as it was all through historical times. But that account also shows that the presence of cultivated areas, very rare and limited as they are, whether marked by ruined sites or still occupied, explains how it was possible for Alexander, while taking his army along this route, somehow to overcome the greatest of all the difficulties presented by it, that of the scarcity of local supplies.

A comprehensive treatment of all classical notices concerning ancient Gedrosia cannot come within the scope of this paper. But such points as concern the route followed on Alexander's march through it after leaving Las Bela, and certain incidents of it, as recorded in the extant narratives, may suitably come under review here.

As regards the choice of the initial portion of the route special attention deserves to be paid to the passage which in Arrian's account follows after what we have been told of the start from the territory of the Oreitai through the defile leading to that of the Gedrosians (see p. 216). "From there Alexander went on through the country of the Gedrosians by a route both difficult and

[1] See 'An archaeological tour in Gedrosia,' pp. 52–144, for explorations from the Kech and Dasht valleys as far as Kolwa and Jhau; 'Archaeological reconnaissances,' pp. 70–177, for exploration between the Dasht valley and Bam.

lacking in supplies; in especial the army often found no water; but they were obliged to traverse a considerable part of the country by night, and at a greater distance from the sea; whereas (ἐπεὶ γε) Alexander himself desired to work along the sea-coast to see such harbours as there were and to get ready what conveniences were possible for the navy, either by digging wells, clearing open spaces, or preparing anchorage. But the Gedrosian country was entirely desert along the coast line" ('Anabasis,' 6, xxiii, 1 *sq.*).

So Alexander instead of proceeding himself to the coast sent there Thoas, son of Mandrodorus, with a few cavalry to see if there were any anchorage possible in this direction, or water near the sea. When Thoas had returned from his mission with a report clearly describing the miserable condition in which the scanty fishing folk lived along the coast, there could obviously be no question for Alexander to turn south again from the ground he had reached in the Welpat tract and at the expense of long marches to seek the vicinity of a coast so utterly devoid of resources for feeding his army either with the fleet or on land.

This consideration by itself suffices to make it impossible to accept the theory set forth by Sir Thomas Holdich which places the narrow defile where the Oreitai and Gedrosians tried to stop Alexander at the open flat watershed at the head of the Phor valley, and from there makes Alexander move down to the mouth of the Hingol and then up the Hingol to the Parkini valley.[1]

What we are told by Arrian immediately after the mention of the return of Thoas with his report on the conditions along the coast, distinctly indicates that Alexander after having forced his way through the defile at the border of the Oreitai and Gedrosia took the route through Jhau, Kolwa, and the Kech valley which offers itself as a natural main line of communication through Makran towards Kerman. "When Alexander arrived at a certain tract in Gedrosia where provisions were more plentiful, he distributed what he obtained among the baggage trains; and this he sealed with his own seal, and bade them convey it to the sea. But when he was going towards the halting place from which the sea was nearest, the troops, making light of this seal—even the guards themselves—used these provisions and gave shares also to those most beset by hunger. . . . Alexander learning of the grave necessity, pardoned the offenders. Then by overrunning the district he got together what provisions he could for the army sailing with the fleet, and sent Cretheus of Callatis to convoy [it]" ('Anabasis,' 6, 1 *sq.*).

We may well conclude from this account that whatever supplies were secured in the cultivated tract first reached after the start from the territory

[1] See Holdich, "A retreat from India," pp. 117, 122 *sq.* This theory appears to have been accepted by McCrindle, 'Invasion of India,' p. 169, and has found a record in the 'Las Bela Gazetteer,' pp. 20 *sq.* It is set forth without any critically valid evidence; the fanciful etymological speculations as regards the name *Parkan* (map Parkini) and that of Gedrosia, borrowed from Bellew, does not help to support it. The fact that no cultivable ground is found in the Parkini valley nor anywhere in the barren hills to the north of it from which supplies could have been secured by Alexander, constitutes a grave objection against that theory. On the other hand the Parkini valley was found by us to hold an ample supply of water at a season much later after the monsoon rainfall than the one on Alexander's passage when it is assumed ("Retreat," p. 123) that "there would not be a drop of water to be had" in it.

of the Oreitai, about the present Jhau, Nundara, and Awaran, had been appropriated and consumed by the starving host on the long way down to "the halting place from which the sea was nearest." Doubtful, too, it seems whether any of the foodstuffs requisitioned in the district around that stage ever reached their intended destination on the coast; for Nearchus' careful record nowhere mentions that his fleet ever received provisions from the army on its coasting voyage, after taking in the ten days' supply collected before under Alexander's orders at Kokala near the border of the Oreitai ('Indica,' xxiii, 7).

From our present knowledge of the ground down the Kech valley it appears highly probable that by that "halting place from which the sea was nearest" the important oasis of the present Turbat is meant which after Panjgur is the most populated subdivision of British Makran and for a long time past has held its headquarters. From here a much-frequented road, the easiest of all connecting Kolwa and Kech with the coast and now made practicable for motors, leads down to the small port of Pasni.

That this road, passing through a couple of low hill ranges separated by a wide plateau, was followed by Alexander's army is made quite clear by a passage of Strabo. It tells us that Alexander marching with one of the three divisions of his army through Gedrosia, "kept at most at a distance from the sea of 500 stadia, that he might make preparations along the coast for the benefit of his fleet" (Strabo, 'Geographia,' 15, ii, 4). A variety of statements in Strabo's account of Alexander's march through Gedrosia agrees so closely with Arrian's narrative as to make it quite certain that both used the identical source.

Now Strabo in continuation of the passage just quoted relates the same incident of which Arrian tells us as having happened when Alexander was making his way from the interior of Gedrosia towards the coast ('Geographia,' 15, ii, 6). The guides of the route, so Arrian tells at greater length, lost the way owing to the violence of the wind having obliterated the marks of direction "in the sand which was everywhere and all alike heaped up on all sides, there was nothing by which one could guess the road. . . . So Alexander understanding that they ought to lead the army inclining to the left, took a few horsemen with him and rode ahead; and when their horses began to weary beneath the heat, left behind most of them, and he with not more than five rode off and found the sea . . .; then digging in the gravel, he found fresh and pure water, and so the whole army came thither; and for seven days they marched along the sea coast" ('Anabasis,' 6, xxvi, 4 *sq.*).

In close agreement with this Strabo relates how the king on perceiving that the guides had lost the way, "set out at once in search of the coast. When he had discovered it and by sinking wells had found there was water good for drinking, he sent for the army; afterwards he continued his march along the shore for seven days with a good supply of water. He then again marched into the interior." [1]

On comparing the two accounts drawn from a common source it becomes obvious that both refer to the same march of Alexander from the interior of Gedrosia to the coast, and that Strabo's statement of keeping "at most at a distance from the sea of 500 stadia" in reality represents the distance measured

[1] Strabo, 'Geographia,' 15, ii, 6, as translated by McCrindle, 'Ancient India,' p. 85.

by Alexander's bematists from the halting place which was nearest to the coast, as recorded in the original source. It is obvious that the Bematists' distance measurement could be effected only on the route actually followed and could not be taken from what a map based on triangulation might have shown as to the greatest distances at which the route taken by the army had kept from the coast since leaving Las Bela.

Fortunately a reference to what an exact modern map shows for the ground between Turbat and Pasni,[1] affords full confirmation of the conclusion reached. The caravan road from Turbat, the main village in the well-cultivated portion of Kech proper, passes across the Gokprosh hill chain of the Makran Coastal Range in a south-eastern direction. After crossing a wide plateau where water and camel grazing are obtainable at easy stages, it descends through a gap in the outermost hill chain of the Coastal Range due south to Pasni bay on the coast. Here on this last stage the road passes through what the map shows as a maze of low sandy hillocks, apparently wind-eroded, which stretches west for some distance towards the low, partly cultivated, plateau of Kulanch. It is on such deceptive ground that the incident related by Arrian and Strabo might well have taken place. The road distance from Turbat to Pasni as measured on the map, is approximately 60 miles. This when converted into Attic stades at the rate of 8 stades to the mile is in strikingly close agreement with the 500 stadia recorded by Strabo.

With this section of Alexander's route definitely determined it becomes easy also to locate the references found in Arrian's narrative to ground both in the north and south of it. Through Turbat there passes a main road north-eastward to the Panjgur tract, the best cultivated portion of British Makran. There can be little doubt that supplies secured from there are meant where we read in connection with "the halting place from which the sea was nearest" that "the inhabitants also were commanded to bring down provisions from the upper districts, grinding as much corn as they could, with dates from the palm trees, and keep for the army to purchase" ('Anabasis,' 6, xxiii, 6). The mention here made of dates points particularly to Panjgur which is to this day famous for its abundant produce of fine date fruit. The mention made of the upper districts is quite correct as the main valley of Panjgur lies at an elevation considerably higher than the Kech valley about Turbat and hence enjoys also a cooler climate.

Turning to the south where Alexander's route had reached the coast, both Arrian and Strabo in agreement furnish us with the useful information that after finding water at the shore "for seven days they marched along the sea-coast, getting water from the shore, and thence, for the guides now began to recognize the road, he led the army into the interior" ('Anabasis,' 6, xxvi, 5). Thus Strabo, too, tells us that Alexander "by sinking wells had found there was good water for drinking, he sent for the army; afterwards he continued his march along the shore for seven days with a good supply of water. He then again marched into the interior." [2]

[1] See the quarter-inch sheet No. 31 C (Baluchistan) of the Survey of India; for a summary of the road, see 'Makran Gazetteer,' p. 348.

[2] 'Geographia,' 15, ii, 6. Sir Thomas Holdich rightly recognized that the seven days' march along the shore before turning into the interior is correct if reckoned from

I have had no opportunity of following the route from Turbat to Pasni and thence along the coast to the port of Gwadar, as my own march in January 1929, from Turbat to Gwadar led down the valley of the Kech and Dasht rivers. But the Survey maps show that an easy track leads all the way from Pasni to the Isthmus of Gwadar, a direct distance of some 80 miles along the flat shore where drinkable water is to be found in wells of no great depth. Then from Gwadar the terminal course of the Dasht river is gained over flat alluvial ground, mainly along the western bay of Gwadar, over an additional distance of about 40 miles. On following this line up to Gabd, where the Indo-European Telegraph crosses the bed of the Dasht river, ordinarily dry here, the total distance of 120 miles from Pasni could easily be covered in seven moderately long marches.

From the Dasht river the way lies quite open across the border of Persian Makran into the partly cultivated plain of the Dashtiari tract on both sides of the Bahu river. With this tract and with the valleys leading northward towards Bampur my explorations of 1931 acquainted me to a considerable extent.[1]

Neither Arrian nor any other classical records furnish us with any details as to the line followed by Alexander after he had "led his army into the interior. Arrived at length at the Gedrosian capital, Alexander rested his army there" ('Anabasis,' 6, xxvi, 5; xxvii, 1). We are told before by Arrian in connection with "the halting place from which the sea was nearest," that "then Alexander advanced towards the Gedrosian capital; the district is called *Pura;* and he arrived there from the district of the Orii in a total of sixty days" ('Anabasis,' 6, xxiv, 1).

It has long ago been recognized, and I believe with good reason, that the "Gedrosian capital" has to be looked for in the long stretch of cultivated ground which extends for some 24 miles along the Bampur river. This, by far the largest tract of Persian Makran affording agricultural resources, lies at the eastern end of the wide drainageless basin holding the salt marshes of the Jaz-Murian Hamun. This extends thence in a north-western direction towards Rudbar and Jiruft and affords the easiest approach to the centre of the Kerman province, the ancient Carmania. The large fort and adjacent village to which the name of Bampur specifically applies, has down to modern times always been the chief place of Persian Baluchistan, and large mounds close to it attest occupation of the site since prehistoric times ('Archaeological reconnaissances,' pp. 95 *sqq.*). Whether Pura "the Gedrosian capital" of Alexander's time, stood actually there or some 16 miles farther up near Fahrej (Iran Shahr) which since the last century serves as the military and administrative headquarters of Persian Baluchistan, is uncertain. But consider-

the neighbourhood of Pasni; "Retreat from India," p. 124. But in accordance with his theory of Alexander having marched along the Parkan (Parkini) valley he makes him lose his way beyond the Basol river to which that route would have led him; or else he assumes a mistake of numbers in the reckoning of seven days along the shore.

[1] For a record of the observations made in the Dashtiari tract, see my 'Archaeological reconnaissances,' pp. 71 *sqq.* For the topography of the areas traversed from here to Bampur and thence to Rudbar, Jiruft, and other south-eastern portions of the province of Kerman, map No. 1 of the same work may be consulted.

ing the geographical position occupied by the Bampur tract, its agricultural resources and the direction of Alexander's march towards Carmania, it can be safely assumed that it was this tract where "Arrived at length at the Gedrosian capital, Alexander rested his army there," as Arrian tells us ('Anabasis,' 6, xxvii, 1).

There is no philologically sound reason for seeking to connect Pura with the modern name of either Bampur or Fahrej (Iran Shahr). But we are justified in accepting Arrian's statement that Alexander arrived in the district "called Pura . . . from the district of the Orii (*i.e.* Oreitai) in a total of sixty days" as substantially correct if applied to Bampur. Assuming that Alexander proceeded to Bampur from the Dasht river to which we have traced his progress, by the most direct and easiest route which leads through the oasis of Qasrkand and *via* Champ, an approximate measurement on the Survey of India sheets gives us a total rough distance of 410 miles. Or if we take the route I myself was obliged to follow in 1932 from the Dasht river *via* Qasrkand, Geh, Bint, and Fanuch,[1] we get a distance as measured on the map of 470 miles. Even if no allowance is made for a necessary increase of actual marching distance over these map measurements, the time estimate of sixty days for the whole march can in no way appear exaggerated, considering the difficulties of the ground, indispensable halts, and slow movement imposed on an army heavily encumbered by its baggage train, including numbers of women and children ('Anabasis,' 6, xxi, 5).

It deserves to be noted that the location of Pura at Bampur is indicated also by the fact that up the Bampur river leads a direct road to Sistan, the ancient Drangiana. The latter district has at all times served as a granary for the south-eastern portion of Persia and access to its resources would account for the rest which the army was given at Pura=Bampur.

In view of the geographical facts it may be considered as certain that Alexander's route from the Gedrosian capital towards Carmania led through the flat basin in which both the Bampur river and the Halil Rud from the north-west terminate. Though the wide area traversed on this route is for the most part a scrub-covered desert, yet the presence of wells, plentiful grazing, and patches of cultivated ground would allow of the passage of an army without serious difficulty, once supplies had been secured in Bampur.

After cultivated ground in Rudbar on the terminal course of the Halil Rud had been reached, an easy way lay wide open to the north up the amply irrigated fertile valley of Jiruft, and all serious difficulties about supplies came to an end. Numerous mounds dating from prehistoric times down to Muhammadan times, and the large ruined site of the city which Marco Polo knew by the name of *Camadi*, prove how closely inhabited this south-eastern tract of Kerman must have been down to mediaeval times ('Archaeological reconnaissances,' pp. 137 *sqq.*). Kahnu, the chief place of Rudbar, near the southern extremity of Jiruft, may, perhaps, have witnessed the meeting of Alexander with Nearchus. He had brought the fleet safely to old Hormuz

[1] For an account of my journey of about 165 miles from the Bampur river across the present border of Kerman to the lower Halil Rud, see 'Archaeological reconnaissances,' pp. 132 *sq.*

(*Ἁρμοζεία*) and his unhoped for arrival at Alexander's camp Arrian dramatically describes.[1]

Once arrived beyond the wastes of Gedrosia and well within the borders of ancient Carmania, we need not trace Alexander's route farther in detail. As we are told that on arrival in Carmania Alexander was joined by the Satraps of Areia (Herat) and the Zarangians (Sistan) with plentiful transport animals including camels, the troubles of the army on its onward move were then ended.[2] While a portion of the army is said to have been sent towards the Persis by a route nearer to the coast, Alexander himself "advanced by the road leading to Pasargadae" ('Anabasis,' 6, xxix, 1). Taking into account the westerly direction thus indicated, we may reasonably assume that the capital of Carmania which Alexander could scarcely have left unvisited, lay at the time in Sinjan, as it did during early mediaeval times, and not at the present town of Kerman, away to the north of Jiruft.[3]

Having thus completed our review of the route followed by Alexander from the mouth of the Indus to the Persis, as direct knowledge of the ground traversed allows us to trace it in the light of the extant classical records, I may add in conclusion some general observations on that retreat as a whole and notice a few points incidentally brought out by those records. Notwithstanding Nearchus' testimony as to Alexander's quasi-personal motive for deciding upon this hazardous undertaking, we cannot hope ever to receive full light on all the reasons military, geographical, political; also, perhaps, inadequate intelligence, which may have had their share in prompting Alexander's decision. But certain it appears to me that in choosing this particular line of route followed with his troops from Las Bela to Carmania he was guided by what correct local information was obtainable through his staff.

The route we have traced above was clearly the one which was most likely to keep the army within reach of such local supplies as poor arid Gedrosia could afford. In the absence of any hostile opposition to be met, the difficulty about feeding a large force in passing through so great an area, mainly desert and bare of local resources, must have presented the chief problem, just as it would now for any modern commander having to operate in parts of Baluchistan. Gedrosia had been ever since the time of Darius a satrapy of the Achaemenian Empire. Since its charge was given along with that of the Oreitai to Apollophanes,[4] it may be safely supposed that the limited extent of its local supplies must have been well known in the latter territory.

We may assume that the other very serious physical difficulties besetting a march through Gedrosia which apart from want of food account for all the

[1] 'Indica,' xxxiv *sq.*; see 'Archaeological reconnaissances,' p. 177, for the likely location of this meeting.

[2] According to Curtius, 9, x, 17, the much-needed fresh transport and supplies arrived before the force passed beyond the border of Gedrosia. See also Plutarch, 'Life of Alexander,' chapter 66.

[3] See Mr. C. A. A. W. Oldham's remarks, *Geogr. J.* 90 (1937) 560.

[4] For Apollophanes as Satrap of the Oreitai, see Arrian, 6, xxii, 2. His charge of Gedrosia also is not directly mentioned; but in 'Anabasis,' 6, xxvii, 1, we are told that Alexander on arrival at the Gedrosian capital removed him from his Satrapy as he had neglected all his orders. Combined charge of the Gedrosians and Arachosians (*i.e.* the Helmand valley) was subsequently given to Sibyrtius, an administrative arrangement which geographical vicinity explains.

great sufferings undergone by the army, must also have been known before that route for the retreat was decided upon; such were the scarcity and badness of water, the trying climatic conditions, the scantiness of grazing suitable for horses and mules. But if no adequate regard was paid to all these difficulties before that risky decision was taken, it may be well accounted for by the confidence which knowledge of all the hardships and dangers successfully overcome before by this army of conquering veterans must have inspired in their incomparable king and leader.

Such war-hardened troops who had fought their way victoriously over immense distances from the Aegean Sea all the way to Central-Asian steppes in the north and over the vast plains of the Indian borderlands in the south, might well have been expected in the end when at last on their way home from unsurpassed conquests, to face bravely and overcome such obstacles as a mere desert, not altogether uninhabited, would oppose. It was anyhow the nearest way by which they could hope to return with their rich spoils of war to the distant homeland across the vast empire which their valour under a great leader had gained for Hellenic rule.

That Alexander knew well how to inspire his troops while suffering from such trials with complete reliance on his leadership is, perhaps, best illustrated by the incident which, well known as it is, yet deserves to be quoted here in Arrian's words ('Anabasis,' 6, xxv, 1):

"The army was marching through sand while the heat was already burning since they were obliged to reach water at the end of the march; and this was some distance ahead. Alexander was much distressed by thirst and with much difficulty, but still as best as he could, leading the way on foot; so that the rest of the troop should . . . bear their toils more easily when all sharing the distress alike. Meanwhile some of the light-armed troops had turned aside from the rest of the line to look for water, and had found some, just a little water collected in a shallow river bed, a poor wretched water-hole; they gathered up the water with difficulty and hurried back to Alexander as if they were bringing him some great boon; but when they drew near, they brought the water, which they had poured into a helmet, to the king. He received it, and thanked those who had brought it and taking it poured it out in the sight of all the troops; and at this action the whole army was so much heartened that you could have said that each and every man had drunk that water which Alexander thus poured out."

The incident so graphically recorded here by Arrian helps well to illustrate the way in which the nimbus surrounding Alexander's heroic personality is likely to have helped to maintain the spirit of his troops amidst all the grave hardships they endured in Gedrosia.

The modern traveller passing over the ground traversed by the route we have traced, finds it easy enough to realize the great trials which the scarcity of water over many of the marches, the inadequate supply of provisions, the total want of protection from the heat prevailing during a great part of the day in this barren region, must have involved for large bodies of men and their transport animals toiling along here. The present wayfarer still finds sand in plenty where the route passes alluvial flats or wide beds of torrents; but he would look in vain for such "high hills of deep sand not beaten down

but letting men and beasts sink in as if into liquid" as Arrian rhetorically describes ('Anabasis,' 6, xxiv, 4), except in a few places such as on the long descent to the Bampur river or along stretches by the terminal Halil Rud.

On the other hand the distress and heavy loss experienced by Alexander's troops from a great spate suddenly descending at night from the hills in a small stream by which they were encamped, was brought home to me very strikingly by a similar danger experienced by us in 1929 below Turbat.[1] What Arrian tells us on the same occasion of the "great spate of water that drowned most of the women and children among those which followed the army; swept away all the royal pavilion and its contents, and so many of the transport animals as had survived," shows clearly how heavily the army was encumbered on its move. The same conclusion may be drawn from the mention made of the wagons "which the men themselves kept destroying as it was impossible to drag them along owing to the depth of the sand, and also because in the earlier marches they had been compelled for this reason not to go by the shortest routes but by those that were easiest for the teams."[2]

Of the difficulty about transport to which the army was reduced farther on in Gedrosia, we are definitely told by Arrian: "Of the transport animals there was then great loss, even caused deliberately by the army; for whenever provisions began to fail them, they clubbed together and gradually killed off most of their horses and mules and ate their flesh, giving out that they had perished from thirst or had collapsed from fatigue."[3]

We have no, even approximately correct, information about the extent of the losses the army had suffered in men on this calamitous march through Gedrosia; but the concordant account of Alexander's historians shows that the losses must have been heavy. All the same it is clear that when the force with Alexander reached Carmania and thence the Persis, the traditional centre of his newly won empire, it was as an intact portion of his army and not as a disorganized fugitive host. This is proved by the effective steps taken by Alexander on his arrival at the Gedrosian capital as regards the administration of different parts in the east of the Empire and also by the large reinforcements which were promptly brought to him when he reached Carmania by the Satraps of provinces as distant as Parthyaca, Hyrcania, and Media ('Anabasis,' 6, xxvii, 1–3). We may recognize negative evidence of the same also in the fact that in spite of the rumours which must have spread far and wide about this retreat no serious revolt followed during Alexander's

[1] See 'Anabasis,' 6, xxv, 4 *sq.*; 'Archaeological tour in Gedrosia,' p. 57.

[2] 'Anabasis,' 6, xxv, 2. In this connection note may be taken of the curious fact that until the arrival of camels brought by Stasanor, the Satrap of Areia, and the Satraps of northern provinces to assist the army on arrival in Carmania ('Anabasis,' 6, xxvii, 3), no reference is made to these animals. Camels would have been particularly useful for transport of the heavier loads through Gedrosia, and much easier to feed, while horses and mules are repeatedly mentioned. Is it possible that the breeding and use of camels had at the time not yet extended so far south as the lower Indus valley, Las Bela, and Southern Baluchistan?

[3] 'Anabasis,' 6, xxv, 1. The same expedient was resorted to by the Emperor Jovian's army on its sorry retreat from the Tigris through the desert past Hatra; see Ammianus Marullinus, 25, viii, 4; also my paper "The ancient trade route past Hatra and its Roman posts," *J. Roy. Asia. Soc.* (1941) 313 *sq.*

lifetime in any part of the vast dominion he had brought under Macedonian control.

Arrian rightly discredits the story which made Alexander drive through Carmania in Bacchic revelry, to mimic the legendary triumph celebrated by Dionysus after the conquest of India. But we may safely accept his statement made on the authority of Aristobulus that "Alexander in Carmania sacrificed thanks-offerings for the conquest of India, and on behalf of his army, for the safe transit through the Gedrosian desert." [1] This safe return of an army through so great an expanse of inhospitable wastes was indeed an achievement for which history may well give credit to the pluck and endurance of Alexander's hardy veterans and to the mastery exercised over them by their indomitable king and leader.

The author's spelling of place-names has not been adjusted to the spelling of the Survey of India, given on the sketch-map.

SOME ASPECTS OF THE COUNTY OF LONDON PLAN

PROFESSOR PATRICK ABERCROMBIE

Meeting of the Society, 11 October 1943

I FEEL some slight embarrassment in rising to address an audience largely, I presume, consisting of explorers, those who are wont to advance into strange and unknown country of illimitable size and penetrate in any and every direction, whether it be an Arabia Deserta or Arabia Felix, the North or South Pole. I am going to explore and try to explain to you the topography of a certain area beyond which I am not at the moment allowed to trespass. It is an area bounded by an imaginary line and, furthermore, when I come to what should be the kernel of the whole county, the South Pole shall we say, I am to desist altogether from entering that magic circle. Somebody else is already exploring that central area, the City. I hope to explain to you as geographers the very limited area for which a plan has been prepared by my colleague, Mr. Forshaw, the architect and planner to the London County Council, and myself.

Whoever tries to prepare a plan for any town or existing place is always faced with a threefold background to his work. There is the background of Nature, the background of man-made history, and, lastly, the background of the present conditions of the area concerned. Our plan is, in a sense, an escape from those present conditions. We would not have prepared a plan if we had not thought there was some reason to get away from the existing conditions which we found in the area. But there is no escaping from Nature,

[1] 'Anabasis,' 6, xxviii, 1–3. Alexander's retreat from his Indian conquest has sometimes been compared with Napoleon's retreat from Russia in 1812. But it must be remembered that Alexander retained, while he lived, complete hold on his empire, which opened the way for the influence of Hellenic culture into a great portion of Asia, while Napoleon's retreat made under pressure of a valiant enemy was promptly followed by the defection of unwilling allies and finally by defeat and the collapse of his rule.

and I also suggest that there is no real escape from the historic background. They both dog us, they are ever-present, and we must observe them if we are going to attempt to produce anything in the nature of a revised version of the surroundings.

The topography of the area of London, of which I am speaking, is not particularly exciting or interesting compared with the topography of some of the towns of the Earth. It contains one dominating feature, the capricious but masterful and, when man has allowed it to be so, always beautiful river Thames. I call it capricious because for several years I have been studying the Thames, particularly that part from Staines to Cricklade and, recently, from Staines to Gravesend; and still I am always being caught out by reason of the river's extraordinary route, and the variations of its directions.

Apart from the Thames, the features of the landscape of London as it must have existed before there was any town here were not particularly exciting. Some low hills on the north and some low hills on the south. There are slight undulations, a certain amount of low-lying land and, therefore, certain features of geology which have been of great importance to the development of London, the most important being the rather dull but interesting feature of a clay sub-soil. When I say "dull" I mean that there is nothing which produces a more uninteresting landscape than clay. At the same time, it has made possible the creation of the London Tubes.

I am not going to speak at any greater length on the history of London than I have on the topography, but there is the very interesting feature in London that it is really a twin city. It does not emanate from a single focal point. Of the capital cities to which I have been able to give some little study Vienna is much the most markedly a single focal point. London has really a double focal point, a commercial and a political or administrative centre. That provides one of the interesting problems of the planning of London. It is not a single radiation from one centre; it is a dual radiation. In fact, one might almost say that there is a third centre of London, the Agora, the centre of the amusement or the meeting place of the whole of the Empire, the West End. That is distinct from Whitehall. So that there is almost a threefold centre in London to deal with, which makes it more complex than many other cities.

Now London of to-day. We accept London. We realize that London is our Capital. It is overgrown; it is congested; it is squalid by neglect and sprawls over the Home Counties. Nevertheless, there it is; and in spite of all its defects London is and has always been, in the main, beautiful. Any plan for London must accept, in my opinion, as a background those conditions. We must not, we can not, and we should not attempt to dissipate London, to eradicate London, to crowd together something like a series of garden suburbs in the place of the great city of London, using the word city in its broadest sense.

The first necessity in order to study the present conditions of London is, of course, to make an analysis, a careful civic survey of the various aspects and features of London. Fortunately, when Mr. Forshaw and I were called upon to prepare this Plan we found that an enormous amount of work had been done in preparation for planning, but not done systematically. There

was no such thing as a solid volume of a survey of London from every point of view. It was necessary to turn to the studies to be found in different reports produced, often not by an official body; a good many of them, it is true, by the London County Council. Private enterprise has played an immense part in the study of London. I would like to mention only one survey, that by a person who came from the city in which I have spent most of my life, the great Social Survey of London prepared by Charles Booth, an example of most thorough and full investigation into one aspect of London in its then present condition. Although this information is scattered about amongst various publications and reports which required assembly, we had a solid background upon which to build. Particularly the historical side of London had been fully investigated, and the London Society is to be congratulated on the amount of work it has done over a considerable period of years in collecting information and making it accessible.

To attempt a plan of London is really nothing more nor less than to try to effect a balanced form of environment, to try to redress some of the unbalanced developments that have taken place as a result of no sort of planning of a broad character in the past. In attempting this balanced environment we find there are a certain number of what might be called major determinants, some of which are clamorous and tend to dominate the whole scene. In the preparation of a satisfactory plan it is necessary to arrive at some kind of balance between these clamant and clamorous determinants.

The first and most obvious of these determinants is, of course, traffic. Whenever we visit a great capital city we notice first the claims of traffic. I am the last to suggest that when the traffic difficulties have been solved the whole question of the planning or the satisfactory environment of a city has been arrived at; but traffic is the first thing that claims attention. The very fact that traffic slaughters so many men, women, and, particularly, children every year makes one realize that there must be an attempt at some solution of the traffic menace, a menace which is increasing year by year. It does not improve; it becomes worse: not only road traffic but road, rail, and soon it will be also congestion of air traffic. Some horrific figures have recently been put forward on the other side of the Atlantic as to the amount of air traffic in the future not only for human beings but for carrying of goods also. We have to be prepared.

Fortunately in connection with traffic there were available the thorough survey and the suggestions made by Sir Charles Bressy for London road traffic just before war broke out; he dealt with road traffic only, not air or rail. Sir Charles' plan and his proposals were of the utmost value to us.

Almost simultaneously with Sir Charles Bressey's scheme there appeared a most interesting text-book on traffic by the Assistant Commissioner of the Metropolitan Police, Mr. Tripp. He enunciated certain broad principles upon which traffic should be not only controlled but planned. I will not elaborate those; they are dealt with very fully in our report. But, roughly speaking, Mr. Tripp's major contention was that it is necessary to separate much more distinctly than we have attempted in the past through traffic from local approach traffic. Traffic, then, was the first of the determinants we had to deal with.

The second determinant was the all-important question of Housing. We all know that housing conditions in this as in every other densely inhabited European city are most unsatisfactory. There are too many living in overcrowded and bad houses and on overcrowded sites. One of the principal recommendations we had to make was how many persons should be permitted to continue living within the area of the County of London. A very important question, it sounds simple stated like that but it needs an immense amount of investigation, among many other things, as to the amount of light, air, and space people should have in their living conditions for health and comfort. We found, and of course it was common knowledge, that largely owing to the unsatisfactory housing conditions there was a continual migration out of the County of London area; a migration outwards which was producing a condition of sprawl and spread in the surrounding counties. Attempts at limitation of population have continually been made in the past; indeed, ever since people started living together in cities; a time comes when it is said that a town has grown too large; it must not grow any bigger. In Athens it was said that a town became inconvenient when, excluding the slave population, the whole of the administrative population could not meet together and discuss things in full assembly. We have bigger ideas than that, but still we feel the time comes when a town becomes larger than convenient; it becomes overcrowded and some sort of decentralization is necessary.

The third determinant is equally important, that of the Occupation of those living in the area: What do they do? How do they earn their subsistence? In that connection we had, similarly to the Bressey Report for roads, the report of the Barlow Commission which suggested broadly that no new industries should be allowed to be located within the London area. London was given a rather vague definition. Sometimes it appeared to be Inner London; sometimes it sounded as though it were the Home Counties. At any rate there was a suggestion that there was too much industry already in the London area and that no more should be allowed there, and that a great deal of decentralization of industry was desirable.

The fourth determinant is rather more difficult to explain: it is contained in the idea that London consists not only of a great city and a great Empire centre but also consists of a number of Communities marked off from the central mass by certain determinate or more or less indeterminate boundaries; that people, coming back to the Athenian idea, associate personally together in comparatively small groups. One of the ideas accordingly behind modern planning is to return to a smaller unit than the whole city and to think of people as living together, working, playing, and their children going to school in certain sized groups. The communities of London we show in our report are really the remnants of the old villages of which London is largely made up. These communities are by no means co-terminous with the artificial administrative boundaries of any of the areas, the wards of certain towns, or metropolitan boroughs into which London is divided up, but they are a feature of real importance in planning, and if we are to have a satisfactory town of anything like a large size it must be divided up into a series of units, each grouped together eventually to form the whole mass of the community.

The next determinant is that of Open Spaces. The proper distribution of

open spaces according to the population is an essential aspect of planning, and in studying London one finds that, partly owing to historical hazard, the open spaces which are in the centre, and which are probably the most beautiful and most extensive of any city in the world, are very badly distributed. The foreign visitor to London used to rejoice in the sight of Hyde Park and St. James's Park, those beautiful central areas, and if he wanted to look at caged animals he found Regent's Park magnificent. But if that foreigner had penetrated a little farther east towards Shoreditch, Stepney, and Bethnal Green, he would have found hardly any open spaces at all. I always like to think of open spaces not only as places for active recreation but as breaks in the continuity of the urban mass. One gets tired of bricks and mortar however admirable the architecture. One longs to see a break, with green trees, where Nature, even if only Nature under some confinement of man's devising, asserts herself. Open spaces are essential to break up that continuity of the urban mass.

Finally, the last of what I call the major determinants in the planning of a city are the Public Services, those humble services which purvey to us so much that ministers to our every-day comfort and health: a plentiful water supply, a good drainage system, gas and electricity to light, heat, and warm us. Those public services do not always, and frequently do not at all, determine the major lines of our environment but they are ever-present and have to be considered. The service of the Post Office is an obvious feature of enormous importance in our daily lives, but few realize the underground system of wires throughout the area of London owned by the Post Office. These public services of underground London, although they may not be a major determinant such as, shall we say, roads, industry, or open spaces, are a definite determinant when we come to detailed planning. When we want to move a road we find that road has under it certain services which it would be extravagant and uneconomic to move. Very often it is decided to keep the line of a certain road because it has a sewer running through it, and it would not be very satisfactory if the sewer were run under buildings. Or again if the desire is to open a new tunnel, a short cut, or a new tube, it will be found that we have to thread our way through a perfect maze of underground services. In that way public services are very much a determinant of a somewhat negative character. In fact, there are two main outfall sewers from London which are so important that they emerge almost above ground to form long lines of mounds extending for miles in length to the great outfall down the Thames; the road system in the neighbourhood is partly dominated by those enormous outfall sewers. One hesitates to emphasize the dignity of sewers in such a glorious thing as a capital city, but they are most essential to our comfort and health.

Not only are each of these determinants important in themselves but equally important in their interaction upon each other. It is extraordinarily difficult to decide where one will not affect another. I envied Sir Charles Bressey when he was asked to prepare a road plan, because in considering roads only he had a much simpler task, if I may say so, than Mr. Forshaw and I had in drawing up our Plan for the County of London. Sir Charles had nothing to think about but roads; but the whole essence of our plan is that

every one of the different determinants and aspects had to be taken into consideration in conjunction with the roads and with each other. If a road is planned by itself, it may be found that it is cutting across one of the communities of which I have spoken: It is not desirable that a major traffic road should run through the middle of a community. That is something we all wish to avoid: for example, when it happens that a little village has an immense traffic road running through it, cutting the village in two and making it impossible for a child on one side of the main road to pay a visit to a child on the other side, except at the risk of the child's life. On the Great North Road between London and St. Albans there are three villages cut in half by great stretches of traffic flowing along the old Roman Watling Street. That phenomenon of road planning dominating everything else is familiar to us in the country, but the same applies to towns. Major roads should not cut through communities.

Mr. Tripp has revived the mediaeval expression Precinct: just as there are main arteries of traffic, so should there be certain areas free from through traffic. One of the precincts we have attempted to isolate in London is that of Bloomsbury, in which, perhaps because I am connected with London University, I have taken a great interest. We thought Bloomsbury would form an admirable precinct for a university quarter for London; but those of you who have taken a taxi from the West End of London to Euston will have noticed that the taxi-driver has threaded his way through that precinct, taking right-angle turns through the squares of Bloomsbury in order to reach Euston not necessarily by the shortest but by the quietest route. Combining road planning with a university precinct, traffic must not pass through that area but must go round it; there must be provided an efficient traffic route which is equally attractive to the taxi driver and will enable him to avoid disturbing that area by through traffic.

There are innumerable examples which I could give of the interaction between the various determinants. The interaction between industry and housing is an obvious one. It would be very foolish to attempt to take an enormous proportion of the population out and then for that same population to have to come back every day because their work, their industry, was tied to the river or docks and therefore could not be transferred. There is an instance in which industrial location and density of houses are inextricably tied together. We have to provide a policy which will allow people to live reasonably close to their work whether they remain in the centre or move out into the country. A good deal of industry can be moved; how much depends on Government policy. But a certain density, even a somewhat high density, of population is essential in the middle of a great city such as London because much of the work is tied to the centre; it is the great financial centre of the Empire; there are also the docks, and there are the industries tied to those docks.

A plan for London has of course been wanted for the last twenty years, but its scope has been enormously enlarged by the action of the enemy in doing so much destruction. Much as one deplores the dreadful and the most pitiful human suffering that has occurred not only in life but in other personal loss, there is no doubt that the damage that has been done by the enemy has

provided us with an opportunity for producing something very much better than we had before.

Then there is another aspect of planning which should never be neglected in a capital city, the opportunity for a finer, nobler monumental design in the centre of the Empire. After all, London is the capital, and the planner who neglected the opportunities now presented, particularly for remodelling certain somewhat neglected and derelict areas, such as that on the south side of the Thames, would be losing one of the principal advantages of the present moment. The architect and the engineer must construct if the plan is to be complete. We now have the opportunity of creating certain much needed and magnificent additions to London as the centre of the Empire.

A plan is not a piece of geography until it has been carried out, until then it is little more than a primer. In the first instance we need for its realization the support of the London County Council of which we have the leader, Lord Latham, here. But behind the County Council we need the powers of the Government of the country. If the Plan is to remain merely a volume on paper it will not be of very much use; it will have been a matter of great interest to have produced it but it will be a sterile piece of work. We do, of course, realize that the Plan will not be produced *in toto* at once; it has to be achieved in stages; one of the illustrations in the volume shows how a single area could be rebuilt in three stages.

And now I will take a few of the illustrations which appear in our report; they will perhaps show the more detailed application of some of the general remarks I have made.[1]

The first illustration I will take is of historical London (Plate 1) and emphasizes the point that there was a central core of London up to the middle of the nineteenth century, with a series of isolated communities round that central core, most of them being located on the main road, so that they had through traffic passing through their midst. That was typical of London up to the year 1830. A smaller-scale plan (Plate 3) shows the sprawl of London over the Home Counties which has taken place up to 1938; that sprawl is in all directions.

The object of the Dot population plan (Plate 5) is to show the density to which people are living and the way in which the population is distributed over the area. In the middle are areas of high density in which the population rises to over five hundred persons per acre. There are very few gaps in this area and, in order to produce a satisfactory plan it is necessary to take a large number of people outside the county boundary and dispose of them in that area of Arabia Deserta to which I referred in my opening remarks.

Next, three pictures illustrating three types of density roughly within the county area (Plate 4): first, the typical high density and congestion; then an intermediate area which requires a certain thinning out here and there; and lastly a suburban area.

The next two illustrations show the way in which we planners attempt to analyse the existing state of affairs. The Central London area (Plate 6, 2) can be split up into its component parts according to the interests and the

[1] The Plate references refer to the book, the 'County of London Plan, 1943,' of these four are here reproduced by kind permission of the London County Council.—Ed. *G.J.*

occupations. The City is a complex organism; the centre of Government, Westminster, is much simpler; then there is what I have termed the amusement and social centre, adjacent to but distinct from the rest. It is only by analyses of this kind that it is possible to decide what are the essential features of the area and the interests concerned. The residential communities adjoin the important central areas.

A social and functional analysis (Coloured Plate 1) produces an interesting biological diagram, representing the communities of London based on the original communities; the dotted lines represent the shopping centres of the old villages. We have attempted to isolate these communities and to ascertain their interests and how those interests centre on certain focal points. These communities are largely quite at variance with the administrative boundaries produced by Act of Parliament. The administrative boundary of the Lambeth area starts opposite the City and continues to within a short distance from the Crystal Palace, but it consists of communities which have hardly any relationship to one another. Poplar has three separate communities: Bow, Bromley, and Poplar. It is only when one makes an analysis such as this that one begins to realize what is the real biological life of the complex entity we think of as London.

Leaving the general community grouping we next make an analysis of existing conditions of industry (Fig. 14). It is noted how industry first hugs the river Thames, and then flows on to the smaller rivers, the Lea and a small area of the river Wandle, while a large number of industries have sprung up on the main roads, for instance, on the Great West Road: Acton, Park Royal, and similar places. One realizes when looking at a plan such as that how industries have swung themselves out along the main roads.

We have made a first attempt to try to group those industries and to ascertain which are definitely based on the docks (Coloured Plate 11). There is another attempt to sort industries, to collect them out of the residential areas over which they are peppered, and group them into small convenient groups by forming trading estates, leaving houses and open spaces to be more satisfactorily grouped by themselves. This is a first attempt, not by any means a final one, to group industries in the London area.

The road system which we have attempted to produce for London is one which will be, doubtless, much criticized; but it consists of the inevitable form of road scheme for any big city (back of Coloured Plate 4). It comprises a series of radials and a series of rings, and we have attempted to make a quick-traffic ring. Another interesting feature is the picking out of certain radial roads and making them of major importance. In my view these major radials when they get out into the country ought to become one-purpose motor roads. In the centre we have again recourse to tunnels, one forming a north–south central axis and another running from the Embankment and emerging near Victoria Station. We believe that unless there are a certain number of tunnels in the centre of London it will not be possible to cope with the enormous amount of traffic concentrated there.

A somewhat complicated road plan (Coloured Plate 4) shows exactly the same idea as in the previous simplified diagram but applied to the actual topography of the area itself. There is a quick ring road, another crossing of

the Thames, and then the outer circle. The North Circular Road round about where it is crossed on the way north near the Welsh Harp is already largely developed and it is impossible to make it into a rapid ring road. When we come to the outer area, beyond the boundaries of the London County Council, we shall probably have to provide another rapid ring road somewhere within the line of the North and South Orbital roads. Thus there will be two rapid ring roads, and three slow ring roads.

There is a diagram (Plate 17, 1) showing how history dominates the picture when one is dealing with an ancient city. The whole of the traffic which

DIAGRAM OF PROPOSED ROAD SYSTEM

comes from the City and the north, in order to get south, has to pass through the block between Hyde Park Corner and St. James's Park. The parks are, of course, impenetrable. We want to eliminate traffic from the City as much as possible, and we do not want Whitehall to carry more traffic than is necessary. The area south of Regent's Park is largely given over to doctoring and other professional purposes, from whose quarter we want to exclude through traffic. Then there is the University quarter and also the most securely entrenched of all areas in London, the lawyers' quarter, the various Inns. They are completely exempt from interference. We provide a tunnel under Hyde Park; it would be an act of vandalism to attempt to take a main road right through the Park.

The railway proposals we have made have been characterized by some as extremely feeble and by the railway companies as being rashly bold (Fig. 10). Which is the right description I should not like to say. At any rate, we do suggest that certain railway proposals are absolutely essential to the Plan of London; at the same time, we think they might be considered by a special

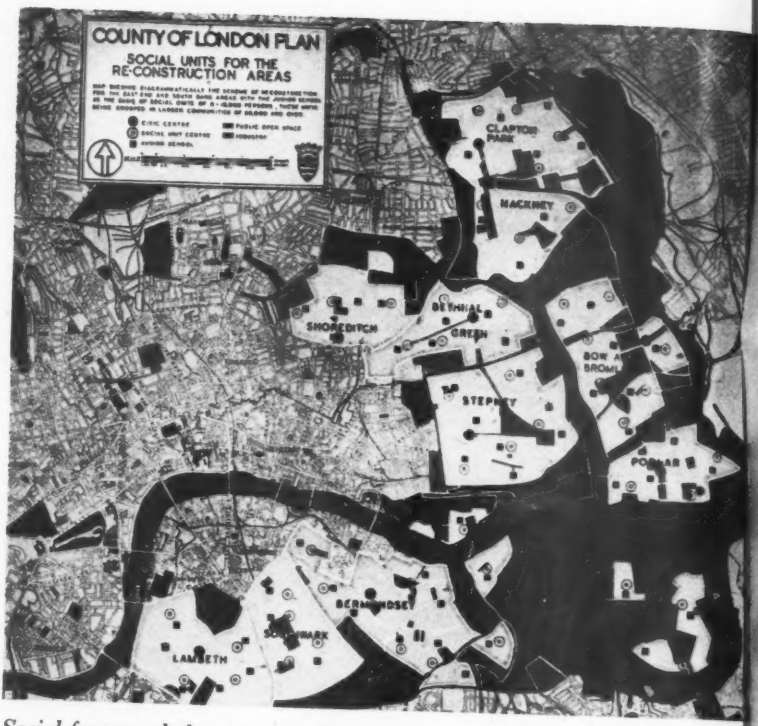
committee set up for the purpose. Our major proposal is the elimination of railway bridges across the Thames and the dead ends at Charing Cross, Blackfriars, and Cannon Street. In place of the railway bridges and the cul-de-sac stations we suggest a deep level running underground so that it will be possible still to get to Charing Cross, Blackfriars, and Cannon Street, but without having to cross the river by an overhead bridge. The proposal is difficult, but we think something can be done in that direction.

We have paid a great deal of attention to Open Spaces, which we think one of the most important of all the features of London (Coloured Plate 3). Unfortunately, we do not think it possible to obtain the full proportion of open spaces that there should be within the London County area. We think however we can provide 4 acres per 1000 persons as against the standard of 7 acres per 1000 generally recommended. At present Shoreditch has 0·1 acre of open space per 1000, mostly graveyards! The provision of open spaces causes decentralization just as much as does reduction in density because open spaces have to be found in parts of London at present used for housing purposes. We suggest that if it is possible to provide 4 acres per 1000 persons within the area of the County of London, the 3 acres per 1000, which is required to make up the standard will have to be obtained outside the county, somewhere in the green belt.

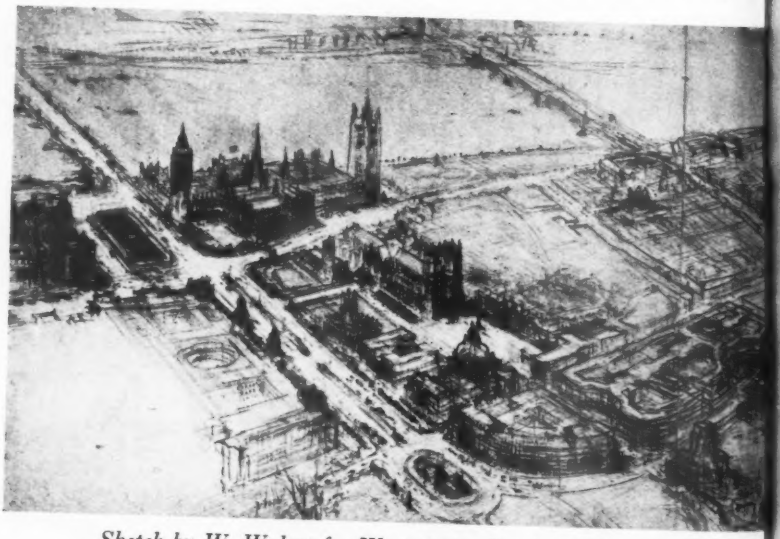
A somewhat complicated illustration (Plate 36) depicts the rebuilding of the East End of London, and, on the south, the Surrey side divided up into communities such as I have described. Lambeth proper, not the gigantically long strip, is divided up into five sub-communities. We have worked upon the theoretical suggestion of the division into major communities and sub-communities, or neighbourhood units, as we call them, arranged largely according to school population. There is an elementary school and a population of between six thousand to ten thousand for each of those sub-communities. The division is based on the requirements of school and shopping and hospital accommodation to ensure that we do not produce an enormous conglomeration of continuous housing but real groups of human beings living together in numbers that are capable of convenient and easy social intercourse.

There are one or two illustrations of the type of communities that will spring up according to this theory of grouping (folder facing p. 102), part of Shoreditch and Bethnal Green and, incidentally, the remodelling of Liverpool Street Station.

The next three illustrations (Coloured Plates 7, 8, 9) give the three stages in which the Plan can be carried out, showing how a single area could be rebuilt by degrees. One shows the complete rebuilding of Shoreditch with a large area of open spaces, a civic centre, and accommodation in flats and small rows of houses with smaller open spaces at various intervals. Industry, which is at present scattered all over that area, is located in groups and also in some tenement factories, small industries being collected together in buildings let off in sections. Such a plan could be realized in two or three successive stages. The first stage could begin with the areas which have been bombed and damaged and which are now available for rebuilding. Two blocks of the bigger flats can be erected, a small group of tenement factories,



Social framework for reconstruction areas : East End and South Bank (Plat



Sketch by W. Walcot for Westminster Precinct (*Plate 52, 1*)

and there could also be one area of separate houses. The next stage is a more definite working towards the completed scheme. Whether it will all work out as neatly and satisfactorily as Mr. Forshaw and I have planned remains to be seen, but there, at any rate, could be gradual realization of the Plan. With the whole Plan before you you can see all the stages and at the end arrive at something not quite the same as, but at any rate as good as, the plans prepared.

A very elemental diagram is devised to show three urban densities (Fig. 19). The centre of London, the Empire centre, which is not intended for industrial housing at all, has two hundred persons per acre. An area surrounding that centre, which includes most of the East and the South side of London, has one hundred and thirty six persons per acre. Outside that there is an area with one hundred persons per acre. Areas of lower density could be interposed within these maxima, where desired.

We keep practically the same industrial use of the river as there is at present, but we think the warehousing use is extravagant and it has been reduced by various means. Also we have increased the open space use of the river. One notes the extraordinary way in which the public flock to the smallest outlet on the river front. We suggest that the 9 per cent. at present used as open riverside space should be increased to 30 per cent. for public use.

A model which we have made shows suggested remodelling of the south bank (see Diagram Fig. 25). Not far from the County Hall there is an area almost all laid bare and available for more or less immediate development. We suggest that there be a new road bridge to take the place of Charing Cross railway bridge, and a new bridge opening up the south bank of the river, which should eventually equal in importance the north bank. An area for new buildings could in the later stage be carried beyond Southwark Bridge to the Cathedral. In our report we carefully deal with that south bank development, showing how it can be carried out in a series of stages.

To isolate the Houses of Parliament and Westminster Abbey from the through traffic which rushes past them to-day an attempt is made to create a precinct by diverting Victoria Street (Fig. 26). I do not think I have ever met man, woman, or child who would not rejoice in the curtailment of Victoria Street. We allow the street to run a certain length and then divide it in two branches to isolate the area round the Abbey and the Houses of Parliament. Victoria Street forks and runs over Lambeth Bridge on the one side and over Westminster Bridge on the other. Farther back the traffic plunges into a tunnel, goes under the Embankment and emerges elsewhere, so that the whole of the through traffic is eliminated from that precinctal area round the Houses of Parliament and the Abbey, thus providing a fine forecourt to the Abbey which would have something of the repose of the close of a cathedral. We have shown in our report with as much care as we can how that project could be realized in a series of stages. A certain amount of the necessary work could be carried out quite easily at once.

In the University precinct at Bloomsbury, with the British Museum and the University of London building, we hope to see a complete Latin or university quarter, free from the intrusion of through traffic (Fig. 6). How the traffic is to be regulated remains to be seen, but we think it can be done.

A tunnel which runs under the road between those two buildings provides an engineering problem which has yet to be solved.

I have attempted a brief survey of, first, the way in which we have attempted to approach the planning of London, and secondly, some of the actual solutions we have tried to put forward for its future. As I have said, realization of the Plan will take a number of years, but we hope that the early stages which we propose are easily realizable, that the roads, the improvement of the south bank of the river, new housing in the East End, and a number of new parks can be put in hand at once, and that thus the Plan will prove a solid advantage to London, whether the final stages are carried out according to the lines of our scheme or not. It is necessary to plan in periods and each of the periods must be of value in itself. If the whole Plan is realizable, then the final result will be an adequate centre of the Empire.

DISCUSSION

Before the paper the PRESIDENT (The Rt. Hon. Sir GEORGE CLERK) said: Many Fellows will have read the Report on the County of London Plan, prepared by their architect, Mr. J. H. Forshaw, and their distinguished adviser, Professor Patrick Abercrombie. That report was prefaced by a stimulating introduction from the pen of Lord Latham, the leader of the Council. I am glad to say all three are present this evening. Professor Abercrombie has very kindly undertaken the task of exhibiting to us some aspects of the Plan which, apart from its absorbing general interest, has many features in it of geographical interest and importance.

Professor Abercrombie then read the paper printed above, and a discussion followed

The PRESIDENT: I do not know whether I can ask Lord Latham to say a word on the extraordinarily stimulating lecture to which we have listened. We shall be grateful if he will address us.

Lord LATHAM: We have listened to a graphic and objective exposition of the County of London Plan. You will not be surprised if I tell you that this is not the first time I have listened to an explanation of that Plan, but I am at all events quits with Professor Abercrombie. Last Monday week he had to listen to me lecturing upon the County of London Plan, and now I have had the pleasure of listening to him. He enjoys, of course, a greater measure of freedom and less responsibility than I in talking about the Plan because, after all, he is the consultant. I happen to be the leader of the authority which had the Plan prepared and throughout the course of his lecture he sought to inspire me, in case that were necessary, to get on with the work as quickly as possible.

I think you will agree that the Plan is probably the greatest objective study of the infinite variety of planning problems connected with a great centre of population, one of the greatest centres of industry and commerce, and even of heavy industry, in this country: the capital of a Commonwealth and an Empire and also the seat of national administration.

The Plan is more than the mere physical location and siting of roads, buildings, and open spaces. It is a great sociological study of the needs of the population, in their work and in their play, and we of the London County Council are much encouraged to find that not only is the Plan of great interest to the people of London and a great contribution to the solution of our problems in London, but also of like problems throughout the provinces. Great interest is being

taken in the Plan as offering an approach to problems similar in character, although perhaps less in magnitude, which exist in almost every city and town in the country. Moreover, the interest in the Plan is no less, proportionately, in some of our Dominions and in the United States.

The Plan is now being studied by the many statutory authorities which exist in London. Planning is difficult enough, but local government in London is also sufficiently complicated. There are about eighty statutory authorities which are entitled to be consulted and we are consulting those authorities. We have also taken, I hope, every proper step to enable the people of London to express their views upon the Plan. We have published it in a handsome and attractive book. We have held an exhibition at County Hall which was attended by some one thousand three hundred persons a day. We propose to re-open the exhibition at the Royal Academy on November 3. We are having lectures given to the older scholars in our schools, many of whom have visited the exhibition, because this is an opportunity for an exercise in practical civics. Moreover, it is those young folk who, after all, will have to live in the London of the future, whether it be planned or unplanned; it is mainly their London with which we are concerning ourselves to-day. We have invited the opinions of all sections of the people upon the Plan, and I think you will agree that, if democracy is government by discussion, then we have sought to be eminently democratic.

I am quite aware, as is the architect to the London County Council, Mr. Forshaw, and also the Council's consultant, Professor Abercrombie, that whilst they may have produced a County of London Plan they have also produced an engaging bunch of problems for the London County Council, and it will be the business of that Council, when it has examined and considered the views of the statutory authorities and others, to decide upon its policy with regard to the planning of the County of London.

But, Mr. President, the great value of this Plan, and indeed, of any plan, is that it should make the people of this country planning-minded, not necessarily attached to any particular conception or to any particular project, but that it should lead us to be determined that when we rebuild London, as we must rebuild a goodly part of it, because it has disappeared under enemy attack or it is ripe for disappearance under our own attack, we do so according to a plan and not in a haphazard, disordered, and unregulated fashion, as was done in the past.

You observed, no doubt with approbation, the solicitude which the planners have evinced for the Houses of Parliament: that in the Plan they are to be put in a precinct; they are to be given quiet and calm. But I cannot fail to note that, notwithstanding the fact that Professor Abercrombie has spent much of his time at County Hall during the last two years, he has left County Hall out of the precinct. Whether he did that from his experience of the unceasing activity which always characterizes County Hall or for any other reason, I will not say.

However, the County Council are entitled, I think, to credit that they asked their architect, in association with Professor Abercrombie, undoubtedly the greatest town-planner in this country and probably anywhere else, to prepare this Plan, and that by doing so the Council has made a great contribution to the study of the science and art of town-planning. What we now need from the people of this great city and, indeed, the people of the country as a whole, is faith and courage to see that in the future we re-plan our cities.

The PRESIDENT: We have listened to a lecture of an especially interesting nature. If I may speak for myself, what particularly impressed me was, almost in the words of the leader of the London County Council, the audacity and the

vastness and the scope and the imagination of the planners and those who, like Lord Latham, encouraged them to plan. They are, indeed, planning for the future. Their dreams may not take practical shape as they have dreamed them, but in what they have done they have started the younger generation on the road that they have to travel if their London is to be a London that is more worth living in than the old slummy, ramshackle London that older men like myself have known and loved. Thanks to such men as Lord Latham, Professor Abercrombie, Mr. Forshaw, and many others, there will arise, I am certain, a better London. We cannot start a Plan such as this without it going on, and the faith, the courage to produce this greater, this better, this healthier, sounder, and happier London will be there and will bring about realization. I can only express to Professor Abercrombie our grateful thanks to him for giving us this opportunity of listening to what he has told us of the birth of these great thoughts.

THE INTERNATIONAL REGIME OF THE DANUBE

OTTO POPPER, Technical Adviser Czechoslovak Government

Afternoon Meeting of the Society, 8 November 1943

I WOULD like to speak this afternoon on the physical and technical changes which the greatest river of Central Europe, the Danube, has undergone since 1918; on the machinery of its administration in so far as it has inspired or influenced such changes, and on the effects of these changes. It would have been tempting indeed to give you at least the outline of the long history of the Danube, this majestic river which, under the name of the Ister, formed part of the *limes Romanis* and has ever since then influenced the political events in Europe and has in turn been influenced by these events.

With admiration for the art of ancient Roman engineering we inspect the remains of Trajan's ingenious technical achievements in the Sector of the Iron Gates, the design of his bridge, the daring lay-out of its tow-path, and the alignment of the channel intended to overcome the most important cataract of this region. About eighteen centuries later a committee composed of the most famous hydrologists of the day recommended exactly the same place for the construction of the present Iron Gates Canal. The *fossa Carolina*, a reminder of Charlemagne's attempt to link the Danube with the Rhine, is another instance showing that artificial changes of geography considered of utmost importance in our time, were already envisaged more than a thousand years ago.

Having regard to the short time at our disposal I must limit my account to the period of twenty years during which the Danube formed the natural link between seven free nations, *i.e.* the time between the defeat of the Central Powers in 1918 and the collapse of European peace in Munich in 1938. This short interval of time may be called the period of the International Regime of the Danube.

Although it was on the banks of the Danube that the notion of international

rivers was originally discussed and formulated—I am referring to the Congress of Vienna in 1815—it remained a dead letter except as regards the delta of the river where, since 1856, the European Danube Commission supervised the application of those principles. In fact the Danube was under the aegis of Austria-Hungary in the upper and middle course, including the Iron Gates Sector, which, although technically opened since 1896, remained virtually closed for foreign shipping by the imposition of prohibitive dues. The lower course was under the rule of Romania. Though for financial and commercial reasons much of the river traffic was carried by foreign ships, mostly Austrian and Greek. Russian interests were concentrated on the mouth of the river and on the Prut.

Austria's predominance on the Danube was not only political, it was also technical. Navigation on the Danube such as it exists to-day was founded by Austrian enterprise. As early as 1830 the first steam-driven river craft was introduced on the Danube system by an Austrian shipping company. This company improved the technical conditions of the river at many points, even beyond its national frontiers. The temptation must have been great in those days to use such technical achievements for political purposes.

Thus Austria-Hungary had a firm hold on the Danube as a whole. This state of affairs prevailed until the advance of the Allied Armies along the river from the east in the autumn of 1918. During the first period, that of purely military operations, there was obviously little room for civilian traffic. In order efficiently to employ the requisitioned river craft and the floating material at the disposal of the Navy and the Army, the Commander-in-Chief of the Allied Forces in the Orient instituted the "Commandement de la navigation du Danube," and Admiral Sir Ernest Troubridge was appointed Commander-in-Chief of this new Command.

This happened in November 1918, exactly twenty-five years ago, and I would like to take the opportunity offered by this anniversary to pay tribute to the memory of this outstanding man whose name will always be linked with the Danube. Gifted with an open mind and an open heart he realized at once the importance of the Danube, its possibilities and its shortcomings, and he showed a deep understanding for the many complicated problems connected with the river. I shall always remember him as an inspiring personality, full of energy, foresight, and fairness; in fact as a man who personified all true British virtues.

Admiral Troubridge realized the importance of carrying relief to the exhausted Danubian Countries and the necessity of resuming commercial navigation in spite of the poor condition of the bulk of the Danubian fleet. At his suggestion the Supreme Economic Committee decided on 22 May 1919 that "despite the existing uncertainty concerning the frontiers and the ownership of the floating material, normal conditions of traffic on the Danube should be re-established as soon as possible" and that in order to achieve this an Inter-Allied Danube Commission should be instituted under Troubridge's chairmanship. Owing to political troubles in Hungary and in Austria through traffic on the Danube was not resumed until the autumn of 1919.

On 23 August 1919 the Supreme Economic Council had issued further detailed instruction as to the constitution of the Inter-Allied Danube Com-

mission. It was to be composed of representatives of the Great Powers and of the Allied Riparian States. Its task was to re-open the traffic on the whole river under conditions of equality of treatment and so to act as a forerunner of an International Commission envisaged by the Peace Conference.

What the Inter-Allied Danube Commission carried out during the few months of its practical existence ranks among the finest achievements in organization, administration, and techniques. Traffic conditions very near to normal were reestablished, notwithstanding innumerable difficulties such as uncertainty of ownership, political reluctance, the poor state of the channel, and the acute lack of fuel. Politics were banned from transport which was considered exclusively a Public Utility Undertaking.

On 17 June 1920 the Inter-Allied Commission handed over its functions to the International Danube Commission, convoked by decision of the Conference of Ambassadors in Paris. The Allies and the Central Powers met on terms of complete equality and the common task, vital to all concerned, was initiated in perfect harmony. In the short period that followed, pending the decision of the Danube Conference in Paris, the International Commission, having approved all the measures introduced by its predecessor, extended and strengthened cooperation between the riparian States for the development of the river and of its navigation. The more or less *ad hoc* measures taken by the Inter-Allied Commission were systematically organized and broadened. Detailed studies were made regarding the unification of navigation rules, the marking of the channel, improvements in its navigability, hydrographic service, forecast of water-levels, navigation dues, etc.

Great satisfaction was felt when the issue of safe conducts and the fuel control, so important at the beginning, were dispensed with, general conditions of navigation on the Danube having by that time become normal and in some cases better than ever before. Nevertheless there were cases where the freedom of navigation was not fully respected. Overheated nationalism and particularism gave way only gradually to more liberal views. The round trips of the vessels were sometimes unduly delayed and other problems had to be dealt with. The mere fact however that the representatives of the riparian States kept in constant touch with each other on the neutral platform offered by the Commission greatly helped to smooth over difficulties by informal negotiation.

On 23 July 1921 the new charter of the river, the "Convention instituting the definitive Statute of the Danube," was signed by all the Danubian States and by Great Britain, France, Italy, Belgium, and Greece. This convention declared navigation on the International Danube System open to all flags under conditions of complete equality. This freedom was to be safeguarded by two bodies: the International Danube Commission instituted for the Fluvial Danube from Ulm to Brăila, and the European Danube Commission which had been in charge of the Maritime Danube, between Brăila and the mouths of the river since 1856.

The latter Commission had to carry out the necessary works in order to allow seagoing vessels to reach Brăila. It had extra-territorial status, its own jurisdiction, and the authority to levy shipping dues in order to cover expenses. Of its original members only Great Britain, France, Italy, and

The Danube System

Romania remained members of the Commission. By special request other European States were eligible once an adequate case for commercial, shipping, and political interests had been established and the unanimous consent of the Governments represented on the Commission had been obtained. The European Danube Commission thus reformed entered upon an inheritance which did not look very promising. There were three fundamental difficulties which grew in acuteness during the period under survey.

First, the regulation of the Sulina branch: with the constant extension of the dykes into the sea, costs rose steeply but the practical results became increasingly doubtful. Second, owing to the great fluctuation of the Commission's financial resources which depended on the yield of the Romanian harvest, cereals being the main cargo of the tax-paying vessels, it was impossible to establish a long term technical programme and therefore operations had to be continued on the old and somewhat unsatisfactory lines. And third, the Romanian Government which was hostile to the idea of an extra-territorial body being in charge of such an important concern. Unfortunately Romania gradually succeeded in establishing her case, and ultimately this led to serious encroachments upon the authority of the European Danube Commission.

It is probable that in future the regulation of the Sulina branch will be abandoned and that the Danube navigation will have a much more convenient outlet to the sea by means of a canal to be constructed between Cerna-Vodă and Constanţa. This artificial canal would shorten the Danube route to Central Europe by about 250 kilometres and would thus greatly contribute to the economic value of the river.

The Fluvial Sector of the river between Ulm and Brăila, in accordance with the Statute, became the sphere of the International Danube Commission. It was here that the freedom of navigation thus proclaimed and guaranteed had its particular significance. The Danube was no longer the good old Blue Danube which in the economic unit of Austria-Hungary was only a second-rate outlet to the sea, very much handicapped by sea-ports of great capacity. The river now formed the main gate for several Central European States and became the natural link between these States, forming a common outlet towards the sea. Their economic life depended to a large extent on the Danube. One of the principal tasks of the three non-riparian Allied Powers was to guarantee impartiality.

It would lead us too far to give an analysis of the Statute of the Danube. Unfortunately this fundamental document was drafted during a period when much of the original spirit of Wilson's Fourteen Points was beginning to fade. As it stands, the Statute is a somewhat unsatisfactory compromise between broad conceptions and narrow-mindedness. Its text gave rise to varying interpretations and some of its important stipulations were therefore not applied, as had been hoped, in the best interests of the river and of its navigation. Notwithstanding its shortcomings this instrument contributed to the stability of international cooperation through the medium of the Commission.

I have spoken already of three Great Powers who were represented in this Commission. There was however a fourth present, not a signatory of the Statute, nor represented by a special delegate, but nevertheless playing an

important role. I refer to the spirit of modern technical science, represented by many outstanding personalities. By their ceaseless efforts they achieved remarkable results. Regular meetings of the technical experts and the exchange of views and experiences proved to be of great value. The lasting changes brought about in the geography of the Danube, are with a few exceptions the result of expert collaboration initiated and sponsored by the Statute.

After exhaustive studies and deliberations the necessary numbers and fundamental directives for the future regulation of the river were established and adopted. The depth of the channel was to be not less than 2 metres and the width and the radii of curvatures were to be such as to allow for the simultaneous circulation in both directions of ship-trains consisting of units with a capacity of 1250 metric tons each. All new work carried out on the river and the annual programme of maintenance incumbent upon the riparian Governments was subject to the preliminary approval of the International Danube Commission. If a State did not fulfil its obligations the Commission was entitled to take the matter into its own hands. On the sectors where the Danube formed the frontier the riparian States on either bank were bound to cooperate in maintaining the channel.

To a sea-minded audience the figures of 2 metres and 1250 metric tons of carrying capacity may not be very impressive. But a ship-train on the lower and middle course of the Danube sometimes consists of as many as sixteen barges, comparable with a sea-going vessel of about 8000 N.R.T. This is equal to the figures for the Rhine and far exceeds the long-term projects for the Elbe.

Reviewing the works which have been planned and executed under the auspices of the International Danube Commission, I will examine briefly the course of the river from Regensburg (Ratisbon) downstream to Brăila. Upstream from Regensburg it was used only for insignificant local traffic and, during the period under survey, international interests in this sector were only academic.

The measured length of the navigable channel between the two ports of Regensburg and Brăila is 2209 kilometres (1370 miles), which is considerably longer than the Rhine, Elbe, and Oder combined. The first achievement of the I.D.C. was the measurement and making of tables showing the distances from Sulina. The Commission also supervised the making of a list of the "corresponding Low Water-Levels" all along the river and its tributaries, representing the fixation of the undisturbed equilibrium of its flow, thus giving the relative values of the readings of the different gauges. The drainage area involved measured about 800,000 square kilometres, and several thousand determinations had to be made in the right synchronization to provide the basic indications for elaborate calculations. It was a very fine piece of international teamwork and its results were highly satisfactory.

It is little known that the Rhine–Main–Danube Canal as it is now could never have been executed without the consent of the I.D.C. to divert water from the Lech, tributary of the Danube, into the basin of the Rhine. As a matter of fact, there was no other sufficient supply available for feeding the summit pool of the Canal.

To bring the southern approaches of the future Rhine–Main–Danube

Canal to the desired standard, important improvements in the 174-kilometre stretch between Regensburg and Jochenstein were begun in 1922. The method of deepening the channel by the construction of groynes was used in the upper part of this sector. It takes many years of building, close observation, and gradual extension to achieve the desired effect, which in this case was to obtain a 60-metre wide channel of 2 metres minimum depth. It may be assumed that this channel is stabilized by now, twenty years after its beginning.

Another method had to be applied to the eastern end of the Bavarian sector between Vilshofen and Passau, known as the Bavarian Kachlet. Its stony soil, the sudden changes of currents, and the sharp curvature of the natural channel constituted, particularly during the low-water period, a serious obstacle to navigation. For protection at high water new dykes had to be built and old ones raised. By the construction of a barrage at Steinbach near Passau the waters of the Danube were impounded for a length of about 20–25 kilometres. The difference of water-levels on either side of the cross dyke is 8·5 metres. The potential energy thus stored is exploited in a large hydro-electric plant. Two parallel locks of 230×24 metres each ensure an easy evacuation of the largest volume of river traffic.

This work was completed in 1927 after five years of unremitting labour. The plans being approved by the I.D.C. it goes without saying that the use of the locks was to be unrestricted for all flags and that no dues of any kind were to be levied. The hydro-electric power station alone pays for the whole installation.

Conditions similar to those in the Bavarian Kachlet existed in the region of the Struden between Dornach-Ardagger and Persenbeug in the Austrian sector of the river. Navigation was very difficult in this region and not without serious danger. In 1929 the Austrian Government submitted to the I.D.C. a project intended to overcome this difficulty by constructing a barrage similar to that near Passau. A dyke was to be built across the river near Persenbeug, with twin locks of the same dimensions as those in Bavaria. The fall obtained by storing water was to be 9·6 metres which, together with the much greater discharge, would adequately supply a power plant of three times the output of that at Vilshofen. With the scarcity of coal in Austria this solution would prove of far-reaching economic importance for the country. Furthermore international navigation would benefit since it would remove the great obstacle of the Struden.

For these reasons the I.D.C. unhesitatingly approved the Austrian proposal. Unfortunately the execution of this important project had to be postponed in view of the financial and political crisis prevailing in Austria during the following years. Only after the annexation of Austria, when money had lost its value, and when the Danube had been harnessed for the invasion of the Balkans and the drive towards the Caucasus, was work immediately taken in hand. It should have been completed last year.

Some interesting rectifications of shallows were carried out at the eastern end of the Austrian sector and also in the neighbouring narrow reach of the Czechoslovak bridgehead of Bratislava. In a joint effort Czechoslovakian and Austrian hydrologists achieved a brilliant success near Děvín where the gravel

and sand carried by the Morava into the Danube frequently obstructed the channel. In 1925 the construction of a combined system of groynes and artificial bars in the river bed cleared the whole stretch of about 3 kilometres.

The 155 kilometres between the bridgehead of Bratislava and the mouth of the Ipola, *i.e.* the stretch where the Danube formed the boundary between Czechoslovakia and Hungary, and in particular the 95-kilometre stretch along the Žitný Ostrov, with the exception of the Iron Gates, was considered to be the most difficult sector of the whole course of the Danube. Here the river changes its somewhat torrential character, the fall is suddenly reduced to one-third and, owing to the abrupt decrease of current, it deposits enormous quantities of gravels carried from the mountains.

The old method of middle bed regulation employed before 1918 did not fulfil requirements of this difficult sector and therefore the minor bed had to be regulated. This is a lengthy process involving many years of constant rectifications which are affected by every groyne, cut-off, or blocked channel until finally the shifting bed is stabilized.

Thanks to the cooperation of the Czechoslovak and Hungarian governments these important works were started as early as 1926. Little by little the expected results materialized. There is nothing spectacular from this type of work, but the result produced is lasting. It can be reasonably assumed that the maintenance of the sector has not been neglected during the present war and that by about 1950 a skipper steaming along the Žitný Ostrov will have forgotten the difficulties he had to master in his early days.

A longitudinal dyke of about 4 kilometres was built in 1923 to eliminate the frequent silting up near the lower extremity of the Szent Endrei Sziget (St. Andrews Island) at the northern approaches to Budapest. From there downstream the river, flowing through flat fertile country, presents very few navigation difficulties. Most of the work of the Hungarian hydrologists was devoted to protection from floods, but it was mostly for the benefit of the rich landlords. Yugoslavia, Hungary's successor in the lower part of this region, had more understanding for the needs of her peasantry and, combining protection against floods with draining operations, planned in 1928 and subsequently executed, improvements in the enormous area between the Danube and the Tamiš. Dykes extending over 55 kilometres were built for this purpose along the Danube alone.

Works of a similar nature were carried out in Bulgaria near Vidin, Belene–Svishtov, and Vardim respectively. Their combined length along the Danube is approximately 68 kilometres.

Thus the total length of the new dyke installations in Yugoslavia and Bulgaria amounts to 123 kilometres. I am unable to give you the exact figures of the area of arable land reclaimed, but it may be assumed that it is large enough to offer to many tens of thousands of families greatly improved living conditions. Malaria, which was endemic in some parts of the middle and lower courses of the river, has now been banished from these regions.

Twenty-eight kilometres of flood-protection works were also built in the plain of Karaborz in Bulgaria, between the mouths of the rivers Iskr and Vit.

So far I have given you a survey of the hydrological works which were studied, projected, and, with one exception, carried out during the twenty

years under consideration. The I.D.C. examined, sometimes modified, and finally approved all the plans subject to certain stipulations of international navigation. The Commission however did not interfere with the planning, execution, and financing of the projects, but left them wholly in the hands of the riparian States, in accordance with the Statute.

The situation was quite different in the sector of the Iron Gates. Here the Commandement du Danube, the Inter-Allied Commission, and the International Danube Commission were successively in full administrative and operative control for as much as fourteen years. Only in 1932, after years of intricate negotiations Article XXXII of the Convention was effectively applied. This Article reads as follows:

> "To the effect to maintain and to improve the conditions of navigation in the Sector of the Danube between Turnu-Severin and Moldova, called the Sector of the Iron Gates and of the Cataracts, there will be constituted in common agreement between the two Riparian States and the International Danube Commission, special technical and administrative Services having their seat in Orşova. . . ." But even later on, according to Article XXXIII: ". . . the Commission had to decide, on the proposals of these Services, the necessary measures to maintain and to improve the navigability . . ."

Owing to the different hardnesses of the large variety of rocks forming the bed of the river, the fall is far from uniform in the Iron Gates Sector. The slope is concentrated in five steps giving rise to five cataracts. Until about fifty years ago the passage of this sector was a nightmare for Danubian skippers. Many rocks bear the names of old ships; they are the tombstones of many vessels which perished in the attempt to negotiate these difficult passages. These dangers were brought to an end by the extensive works of regulation which Hungary executed in the 'nineties of the last century in accordance with the Treaty of Berlin. The necessary means were provided by an important international financial loan.

The first of the five cataracts is formed by the granite bank of Stenka. A dynamited channel of 1900 metres now makes it navigable. Another channel

The Iron Gates Sector

of about twice this length traverses the slate bank of Kozla and the reefs of Dojke which form the second cataract. High cliffs force the river into a bed which in certain stretches narrows to 300 metres. The river broadens out to four times this size when it reaches the limestone area of Izlaz and Tahtalja,

which forms the third cataract. There is now a dynamited channel 4000 metres long in this region. After the rocky salient of Greben the river widens suddenly to 2000 metres, consequently becoming shallow. A system of dykes, approximately 5000 metres in length reduces the natural cross-section, thus increasing the depth. Farther downstream the river strikes the serpentine of Jucz which forms the fourth cataract. This is overcome by a channel 1340 metres long.

In the beautiful defile of the Kazan ("kettle" in Turkish) the Danube is forced into a bed which at one point does not exceed 180 metres in width. After leaving this defile and regaining its normal width the river passes the small town of Orşova and then approaches the last and most important of its cataracts: the Iron Gates proper. It narrows to 900 metres from bank to bank and faces the reefs of the massive Prigrada which, 1700 metres long and 500 metres wide, lies diagonally across the river bed. A lateral open canal 80 metres wide and 2200 metres long has been dynamited along the right bank to avoid this cataract which has a fall of about 5 metres. All the other artificial channels referred to earlier and the long channel forming the upper approaches to the Iron Gates Canal proper measure only 60 metres in width.

During the lowest water-levels ever recorded vessels could pass from Turnu-Severin to Orşova drawing 1 metre whereas from here onwards the draught was only 0·6 metre. This marked difference was serious, and it was here that the I.D.C. took over.

Another difficult problem was that of the speed of current in the Iron Gates Canal which considerably exceeded the engineer's original estimates. The speed was such that none of the then existing Danube tugs were capable of negotiating this passage even with only one fully loaded barge in tow. In order to overcome this a special winch steamer was installed by the Hungarian Government. This steamer, by winding herself up on a cable anchored at a distance of 4500 metres could haul herself through the canal with barges in tow. This was an ingenious though slow method which gave adequate satisfaction as long as traffic remained light.

In the course of the 1914–18 war the steamer was seized by the Allies. The Germans replaced it by installing locomotives serving as tractors on the right bank. Many powerful tug-steamers were available at the time and with the assistance of the locomotives the heavy traffic was satisfactorily dealt with. On their retreat in 1918 the Germans blew up the whole installation. After the winch steamer had been repaired the Inter-Allied Danube Commission reinstalled it and the original auxiliary traction in the Iron Gates Canal which served satisfactorily until the steeply increased volume of traffic necessitated a speedier service.

The I.D.C. undertook accurate measurements of the speeds of the current at various water-levels and made a series of trials of the resistance of the various types of barges in order to ascertain the most suitable length of the track for the auxiliary traction allowing each ship-train entering the lower end of the canal to continue its course under its own steam on leaving the upstream terminus of the auxiliary system. These highly scientific measurements led to the conclusion that in order to obtain the desired results the track would have to be extended by 350 metres. This was carried out by the Yugoslav govern-

ment and the improved installation was leased to the I.D.C. which operated it from 1927. It was capable of dealing with the heaviest traffic.

The old winch steamer, now no longer required in the Iron Gates Canal, was transferred to Greben where, during high water-levels the speed of current is almost equal to that in the Iron Gates Canal, although on a short stretch only.

The combined system of auxiliary traction worked so efficiently that even low-powered tugs could pass through the whole sector with a sufficient number of barges in tow. The bottleneck effect of the Iron Gates and the cataracts on the speed of traffic was practically eliminated.

The increased depth of the channel obtained by the river regulation of 1895 removed the danger of striking submerged rocks, but the depth was not sufficient for commercial purposes during the dry season. The Danube Commission improved the depth above Orşova by 0·3 metres. This seems little, but the improvement had great importance. With the lowest water-levels ever recorded a normal 1000-ton barge could carry 250 tons of goods, *i.e.* twice as much as before, and fewer tugs had to lie idle because of their draught. For about twenty-five out of the three hundred and thirty-six days of annual navigation the carrying capacity had been much improved and lightening of barges became unnecessary.

Before this deepening of the channel above Orşova vessels frequently had to trans-ship part of their cargo on to the railway at the port of Orşova. Moreover trans-shipment in Orşova was encouraged by the Hungarian Administration who only levied one-half of the passage dues for cargoes plying in one-half of the sector. It should be remembered that this measure was partly intended to benefit the Hungarian railways. Under the new regime all these technical obstacles and commercial stimulants lost their *raison d'être*. The Iron Gates which were only ajar under the Hungarian Administration were fully opened by the International Danube Commission.

The works necessary for this took many years of mapping, measurement, planning, and execution. Working conditions are extremely difficult in this region of strong currents. Special machinery had to be designed, special crews had to be trained, new methods had to be applied in many cases. The cost of these improvements were however relatively low. The works consisted partly in blowing up of isolated rocks, partly in building groups of groynes to raise the water-levels, and partly in the extension and reinforcement of existing dykes.

The general idea was conceived by my countryman and friend, the famous hydrologist Professor Antonin Smrček, who supervised the works. He also studied the problem of the future canalization of the whole sector of the Iron Gates and designed the general lay-out with the power station. It is a proof of the advantages offered by the internationalization of the Danube that this intricate problem which before had academic value only, now became of general interest.

The Iron Gates Sector offers excellent prospects for such an undertaking. There is a total fall of about 30 metres concentrated in a rather narrow stretch. Taking the average flow of 5000 tons of water per second the available energy could easily be converted into 1,000,000 kilowatts. All these natural advantages notwithstanding there are technical, political, and economic problems

which would have to be resolved prior to the construction of a plant of this magnitude. To speak of the technical difficulties only it must be remembered that with low water-levels which generally prevail during severe winters, the discharge may be reduced to only a quarter of its average volume and that, in extreme cases, there may be scarcely any discharge at all for several days. A 100 per cent. caloric reserve would have to be kept in readiness. It would appear that such a plant could not function as an independent unit, but that it could only form part of an electric grid system covering a wide region, possibly the whole of Europe. In such a system it would constitute one of the most important feeders.

From the point of view of navigation the canalization of the Iron Gates Sector would offer great advantages. But as matters stand at present the conditions are on the whole adequate for many years to come. Detailed analysis of the traffic passing through the sector in the pre-war peak year of 1936 has shown that without any further technical improvements, either of the sector itself or of the Danubian commercial fleet, or any drastic changes in the rules of circulation, the volume of traffic could increase without difficulty to 5,000,000 tons of goods in each direction. Although the increase recorded during the period under survey was very considerable—traffic developed from 250,000 tons from the east in 1921 to 1,850,000 tons in 1936—it is most unlikely that the increase will continue at the same rate.

The main goods carried on the Danube upstream are cereals and mineral oil. Rich oil wells have recently been explored in Yugoslavia and in Austria. Whether it will pay in the future to transport oil from Romania to the upper basin of the Danube is another question. Regarding the export of cereals from the Balkans it should be remembered that this was done at the expense of their population. The eventual shrinkage of the traffic could gradually be compensated by making the Danube the main route for the exchange of goods between Central Europe and Southern Russia. There is certainly no technical difficulty in ferrying Danubian craft across the Black Sea, enabling them to continue their journey on the Don–Volga system without intermediate transshipment. But even so, traffic would increase only gradually and it will be long before the canalization of the Iron Gates Sector becomes an indispensable factor in navigation.

My account of the International Regime would not be complete without some figure of the development of traffic on the river as a whole. The statistics prior to 1914 show that about 8,000,000 tons were loaded and unloaded in the more important ports of the Fluvial Danube and its tributaries. This means that the quantities actually involved were anything between 5,000,000 and 6,000,000 tons. The average distance of haul was not very considerable. After 1918 much of this short-distance traffic was moved by road. International commerce was hampered by artificial barriers, discouraged by politics, and was almost paralized by the financial crisis of 1930–34.

The fact that despite all these most unfavourable circumstances the volume of traffic on the Danube steadily increased is entirely due to the International regime. Not only did the quantity of goods rise from 5,000,000 to 8,000,000 tons per annum, but there was also an appreciable increase in the average haul which, in so far as international traffic is concerned exceeded

the 1000-kilometre mark. This is an exceptionally high figure, characteristic of the Danube.

There can be no question of serious competition between rail and river in this case. They are mutual feeders which cooperate on sound commercial principles and in many cases offer the advantage of combined rates. It is not surprising that under such circumstances new shipping companies were founded, riparian and non-riparian, and that new ports were built as for instance in Bratislava, Komárno, and Budapest. Plans for a great port at Belgrade were ready for execution.

You may be wondering why I have scarcely touched upon any instances where the International Regime of the Danube did not fulfil expectations and why I have not said anything about "le revers de la médaille." There is no doubt that better results could have been obtained despite imperfection in the Statute, had the political and financial position been more favourable. Considering however the brief period of its existence a good deal was nevertheless achieved towards removing the existing technical obstacles and avoiding, as far as possible, new difficulties. Taken as a whole the internationalization of the river gave the impetus to a most promising development of its navigation.

Such was the position on the Danube when its waters were once again troubled by political currents which originated on the banks of one of its tributaries, the river Isar with disastrous results to all riparian States. As early as 1935 new self-propelled barges sailed down the river, the pioneers of the New Order. They flew the swastika flag and were built of bullet-proof steel. In 1936 Germany withdrew from the Commission. In 1938 Austria lost her independence, and Czechoslovakia, my country, was mutilated. The river is temporarily under Nazi rule, but when the Allied armies liberate the countries the Danube will be able to fulfil its destiny and develop into a free link between free, happy, and peaceful nations.

DISCUSSION

Before the paper the PRESIDENT (The Rt. Hon. Sir GEORGE CLERK) said: Mr. Otto Popper is highly qualified to give the lecture which he has kindly undertaken this afternoon because, for many years, he was one of the engineers charged by the International Commission of the Danube with the technical operations under their control. The International Regime of the Danube has many aspects of very great importance which will interest us geographically, politically, economically, and mechanically. Certainly Mr. Popper will not be able to deal exhaustively with all these vast subjects in one lecture, but I am sure that he will tell us of some of the most interesting features of the work and of the results which the Commission achieved in the years between the two wars.

Mr. Otto Popper then read the paper printed above

The PRESIDENT: We have listened to a highly interesting lecture which shows us the very great bearing of geography on politics. I dare say many of you have been on the Danube, perhaps on those steamers plying from Vienna, or possibly going through the Romanian waters as far as the delta. The delta of the Danube is one of the most amazing parts of Europe. In some ways it is further removed from civilization than even some parts of the Congo. There is this vast delta where the river winds and loses itself in fitful streams, moving very sluggishly

around little islands which rise perhaps no higher than 3 or 4 feet. The population is largely composed of all kinds of waterfowl, spoonbills, egrets, and wild swan, and so on, and of Russians who went there in the time of Peter the Great. In the early days the Russians all wore beards, but Peter the Great, who had modern ideas for his time and had lived in Amsterdam where they shaved and wore wigs, thought that civilization should be clean-shaved, so ordered his nobles to give up their beards or their heads. Most of the nobles became clean-shaved. Then Peter the Great ordered the peasants to do likewise. One sect held that to be clean-shaved was irreligious, and refused, but after a martyrdom or two they thought that, on the whole, they had better clear out altogether. They moved down to the delta of the Danube, and there they are to this day, with their old customs and language, and their beards. They are almost amphibious as their lives are spent on or in the mud and water, catching the coarse river fish, which eventually find their way to the markets of Romania.

However that has nothing to do with the lecturer's subject. The important thing is that the Danube is an example of international work which really did its job, and did it well and progressively; there is no doubt that the Danube is again bound to become one of the great passageways of Europe. We shall all look forward to the day when, perhaps in the welter of politics which will continue in those regions, an International Commission is reconstituted and engineers like our lecturer to-day will once more face those problems of which he has given us some indication this afternoon, and create a great and peaceful waterway where the commerce of free and happy peoples will flow. I thank the lecturer for his paper.

DESERT NAVIGATION: SOME EXPERIENCES OF THE LONG RANGE DESERT GROUP

W. B. KENNEDY SHAW

OF the more spectacular achievements of the Long Range Desert Group in Libya some account has already appeared in the Press and in the publications of the Ministry of Information and of the New Zealand Public Relations Service. This article deals with navigation in the desert; a duller but most important aspect of its work which may be of interest to readers of the *Journal*.

The need for navigation, as distinct from map-reading, came from the nature of the country, for the interior of Libya in which the L.R.D.G. operated is the most "deserty" desert in the world, arid and featureless to a degree which the dweller in a northern climate can hardly appreciate. Abolish rain and you remove with it most of the natural landmarks by which the inhabitant of Europe, map in hand, can find his way over the country: streams, lakes, hedges, woods, river valleys, and also the man-made landmarks: roads, villages, towns, railways, canals, which depend directly or indirectly on water for their existence. Thousands of years of heat, cold, wind, and blowing sand have formed the desert landscape, smoothing down the features of past geological eras into vast plains of sand and gravel over which movement by car in any direction is not much restricted.

In the case of navigation, as in that of tactics, the often-drawn parallel between sea and desert warfare holds good. Lack of landmarks compels the deep-sea mariner to rely on sun, stars, compass, and log to show him where he is, and in the desert, almost equally devoid of recognizable features, the sand sailor must use the same methods.

In the summer of 1940 the L.R.D.G. was being formed in Cairo under the command of Major R. A. Bagnold. In navigation, as in many other matters, we were able to profit from the experience of the pre-war explorations, carried out in Libya by Bagnold and other desert enthusiasts to whom the R.G.S. had given generous encouragement and support. There was no need to seek an alternative to the well-tried methods of desert navigation: traverses by sun-compass and speedometer adjusted to astronomically determined positions.

The Bagnold sun-compass has been fully described in earlier issues of this *Journal* (78 (1931) 529). Its use in thousands of miles of pre-war journeys had proved it to be ideal for the job. The Army, to my mind, made a grave mistake in not standardizing and producing adequate supplies of this compass instead of permitting the production of three or four other types in the Middle East. As a result of the Army's decision we had great difficulty in obtaining adequate supplies of the compass in Egypt until in 1941 the workshops of the Egyptian Physical Department began to make them for us. The advantage of Bagnold's sun-compass is that it gives at any moment the true bearing of the course followed, whereas the other types merely ensure that, provided the sun's shadow is made to fall on the appropriate time-graduation, the car is following a pre-determined course. And with these types when, as often appears in broken country, you are forced to abandon the chosen course, the car must be halted and the compass re-set with each change of direction. The delays caused by such halts on long journeys of 100 or 200 miles a day are by no means negligible.

The use of the Bagnold sun-compass as described in the *Journal* for 1931 makes it necessary to carry a book of Davis' sun azimuth tables and to compile each morning a set of values for use during the day. In 1940 to obviate this Bagnold worked out a series of cards, one for each 3° of latitude, showing the sun's azimuth at half or quarter-hour intervals throughout the day for the various seasons of the year, together with the corresponding values for the Equation of Time. In Libya for an hour or more at midday in summer the sun-compass was unreliable owing to the very rapid change in the sun's azimuth, and to the fact that the shadow cast by the vertical needle was too short to reach the graduations around the dial, but this afforded a very welcome excuse to halt and shelter from the burning sun.

In North-East Africa, where the sun shines on almost too many days in the year, a sun-compass is infinitely preferable to a magnetic one for use in a car. A small oil compass is almost impossible to read while on the move in rough country, and even if it can be read the induced magnetism of the engine, guns, and other metal articles in the load will throw it 15–20° in error. Thus when obliged to use such a compass there is no satifactory alternative to halting the car and walking 5 or 10 yards away to take a bearing, and in the desert, when you have done this, you find that four times out of five there

is no conspicuous object on the far horizon to serve as a mark on which to steer.

We tried various types of larger oil compasses on fixed mountings but none were very satisfactory. The best was the P8 Tank compass, mounted on a tall binnacle and compensated with vertical and horizontal magnets and with soft iron spheres. But to be of any practical use it had to be placed where either the navigator or the driver or, better still, both of them could see it and therefore so near to the engine that on at least one of the eight readings the error could never be made less than 6–8°.

L.R.D.G. patrols had frequently to make long journeys at night, hurrying away from the scene of their crimes before the fighter aircraft started their search at dawn. On clear nights the navigator could steer for a time on a star which lay on the required bearing, changing later to another star as the first moved westwards and off the course. And I have known the sun-compass to be used with bright moonlight, though we never got to the point of compiling moon azimuth tables. But cloudy days and nights were the navigator's bugbear and then he had to do the best he could with a magnetic compass.

A dead-reckoning course, based on compass bearings and a possibly not very accurate speedometer, must be checked whenever possible by astro-fixes, and for these we used theodolites which at the beginning of the war with Italy were very hard to obtain in the Middle East. Experiments with R.A.F. bubble sextants showed them to be less accurate in their results and more liable to damage in cross-country journeys, and the supplies of them were no more plentiful. We had a mixed collection of theodolites: a forty-year-old 5-inch micrometer borrowed from the Survey of Egypt and later captured by the Germans at Msus; some vernier models which the navigators thoroughly disliked; a fine compact little Wild; some excellent Watts $3\frac{1}{4}$-inch micrometers; and best of all the Cooke, Troughton, and Simms "Optical Scale," clear to read, sand-proof, and strong enough to stand up to any amount of travel in a bumpy truck.

To find enough watches was another difficulty, for we needed far too many to be able to expect the expensive half-chronometers which the Society used to lend us for desert explorations before the war. The best we could do was to buy good quality pocket watches with a clear second hand. These were not good enough to keep a decent rate in the jolting to which they were subjected, but each patrol had a broadcast receiving set and it was nearly always possible to get a time signal before and after the evening star shots.

In the summer of 1940, faced with the task of teaching the new navigators, I had unpleasant recollections of the lengthy formula (L.M.T. from east and west stars) which I had used for longitude five years before, and which often kept one up half the night to compute. Having had no occasion to take star sights for the past few years I had not realized how much navigational methods had progressed under the stimulation of aviation. The land explorer could afford, if need be, to sit up late over his computations or even abandon them till he returned home, but the airman flying at 200 m.p.h. had to have a method which would give him a fix within a few minutes, otherwise by the time he had worked out his sights he would be over the next country or continent. This need had resulted in the production of the Air Almanac and the

Astronomical Navigation Tables which could be used to obtain a rapid fix by the Position Line method. So we adopted the R.A.F. practice and the normal procedure for the L.R.D.G. navigator was to shoot three stars for Position Line and Polaris for latitude. This, using the A.A. and the A.N.T.'s, would give a position accurate to within a mile or so which was good enough for our purpose, for in the desert if you can fetch up within a couple of miles of the well, fort, or track for which you are aiming you will have little difficulty in locating the actual spot. Air Almanacs were often in short supply, and then we had to make shift with the Abridged Nautical Almanac to obtain the Greenwich Hour Angle of the First Point of Aries and the corrections to the observed altitude of Polaris, and when supplies of both the A.A. and the N.A. failed, Browne, our best mathematician, produced an L.R.D.G. Almanac of his own.

At nightfall the navigator would in any case make a careful determination of his position, but if the patrol was not moving at noon he would also be able at that time to obtain a latitude from the sun's meridian altitude, though at mid-summer some of the theodolites could not be elevated high enough for this. When occasion offered the more enterprising navigators would also observe the sun for Position Line and also the brighter planets whose daytime positions could be calculated with the A.A. and the A.N.T.'s.

An L.R.D.G. patrol consisted of one officer and about fifteen men in five or six vehicles. From the beginning it was clear that the navigation would be a full-time job which the patrol commander could not undertake in addition to his other work, and therefore each patrol had an official navigator, either an N.C.O. or a private, with usually a learner navigator who also plotted the course as a check on his colleague. Among the volunteers of the high standard who came to L.R.D.G. we had no difficulty in finding plenty of competent men; not all of them perhaps would have been able to expound the theory of the methods they used, but with a sound knowledge of the rule of thumb the results were always satisfactory and I have no recollection of a patrol ever being lost.

On the move the patrol commander led the way, steering a general course with his own compass. The navigator rode in the second truck and made a more detailed plot of the route followed. Successful navigation was hard work, demanding unceasing concentration on compass, watch, and speedometer, and the navigators well earned the extra shilling a day which in 1942 the War Office authorized for those who had passed the new trade test of Land Navigator.

When the Group was being formed in 1940 one of the first problems was that of the maps of the country in which it was to operate. Inside the frontiers of Egypt no difficulty arose, for during the last half-century the Survey of Egypt with men like Lyons, Ball, Murray, Clayton, and Walpole, four of them distinguished medallists of this Society, had produced maps of a quality not easily matched. Their 1/100,000 series extends up the Nile Valley and westwards from Alexandria along the Mediterranean coast, and the whole of Egypt is covered by the 1/500,000. On a smaller scale the position was perhaps less satisfactory: the much-criticized International Million provided a useful general map, but the War Office 1/2,000,000 sheet Libyan Desert

is misleading with its "Road suitable for motor traffic: All seasons" from Wadi Halfa to 'Uweinat.

The Italian maps of Libya, except for the 1/100,000 sheets along the coast, were bad. A 1/1,000,000 series covered the whole country with 1/400,000 sheets for about half the area. It was not uncommon to find a well or oasis 5 miles out of place; the hachuring was thick and heavy, and the sprawling cursive lettering not at all clear, so that when the coloured originals were reproduced in Cairo for our use much of the detail was quite illegible.

1/500,000 is a convenient scale for plotting a compass course and 1/400,000 is equally good, though the change of scale at the Egyptian frontier was tiresome, but in some areas, notably north and north-east of Kufra, no 1/400,000 sheets existed and so we had plain, graticuled sheets on that scale printed for the use of the patrols. Before the second advance into Libya in the winter of 1941–42 the Survey Directorate at Middle East had begun to extend the Egyptian 1/500,000 series into Libya, reproducing at the Egyptian scale the Italian 1/400,000 sheets, either as they stood or with corrections and additions by the R.E. Field Survey Companies or by L.R.D.G. By the end of the African campaign they had produced twenty-seven 1/500,000 sheets of Italian Libya, including nine new ones not previously printed by the Italians and on which almost all the detail was the work of the L.R.D.G. or of Bimbashi J. W. Wright, who for many months was attached to the Sudan Defence Force at Kufra.

To the operations of the L.R.D.G. patrols, intent on reconnaissance or raiding, survey was only incidental and it could not be expected that their work in this field could be very accurate or extensive. But this did not apply to the work of the Survey Officer R.E. attached to the Group. In the summer of 1941 Bagnold, appreciating the possibilities of useful survey work in the little-known desert round Kufra, persuaded G.H.Q. Middle East to give him a full-time surveyor. He joined us in July: Lieut. K. H. Lazarus, of the East African Engineers, a member of the Colonial Survey Department in peace time who had been with the Army in the Abyssinian campaign. Five or six of the new 1/500,000 sheets were Lazarus' work, surveyed with careful car and sun-compass traverses between accurate astro-fixes, the latter being at the rate of about fifteen to a sheet, which covered 2° of latitude by 2° of longitude. In the summer of 1942 Lazarus left survey and took over command of one of the patrols, but all the second half of 1941 and the spring of 1942 he was busy on his survey, working with a small party of two or three cars in country which, if the point where the Eighth Army and the Afrika Corps met on the coast can be called the front, was far behind the enemy's lines.

Lazarus brought with him a R.E. draughtsman, first Spr. Griffiths and later Spr. McKenzie, who made fair drawings of his maps, did operational work for the patrols, and collated the information on "going" which we were continually collecting for the Topographical Section of the Intelligence Branch at Middle East. They worked under difficult conditions, in a drawing office which varied from a mud hut at Siwa to a palm-frond shelter at Kufra windowed with celluloid from a crashed Heinkel, the kitchen of the police barracks at Zella, and a good electric-lit office at Hon. Not the least of their

difficulties was to keep the ink in a double pen flowing in a temperature of 115° and a relative humidity which sometimes fell to 2.

In 1922 the interior of the Libyan Desert was almost unknown. Expeditions in the years 1922–40 added enormously to our knowledge and gave the experience with which that knowledge could be exploited in this war. The comings and goings of L.R.D.G. between 1940 and 1943 have left few areas unexplored. But there are a few jobs still worth doing: for example, a careful survey of the interior of the Gilf Kebir and of the still little-known Eghei Mountains between Kufra and Tibesti; and when the car tracks have blown over and the derelict lorries have rusted away, for some people the fascination of travel in that dead world will still remain.

ASPECTS OF THE PROBLEM OF SOIL EROSION IN NORTH AMERICA

MURIEL A. ARBER

THE war-time policy of ploughing-up all available land in Britain must necessarily bring in its train certain problems of soil erosion. These may not often be serious, but their very existence increases the value of all that we can learn about the grand-scale problems confronting American engineers and agriculturalists. Thus, in spite of its having been written under pre-war conditions, there is special relevance at the present day in a popular pamphlet by Dr. C. F. Stewart Sharpe, 'What is soil erosion?' published by the United States Department of Agriculture (Misc. Publicatn. 286, 1938). This clearly written pamphlet by the author of 'Landslides and related phenomena' (Reviewed in *Geogr. J.* 92 (1938) 276), illustrates vividly the main aspects of soil erosion in a way calculated to arouse and hold the interest of the layman.

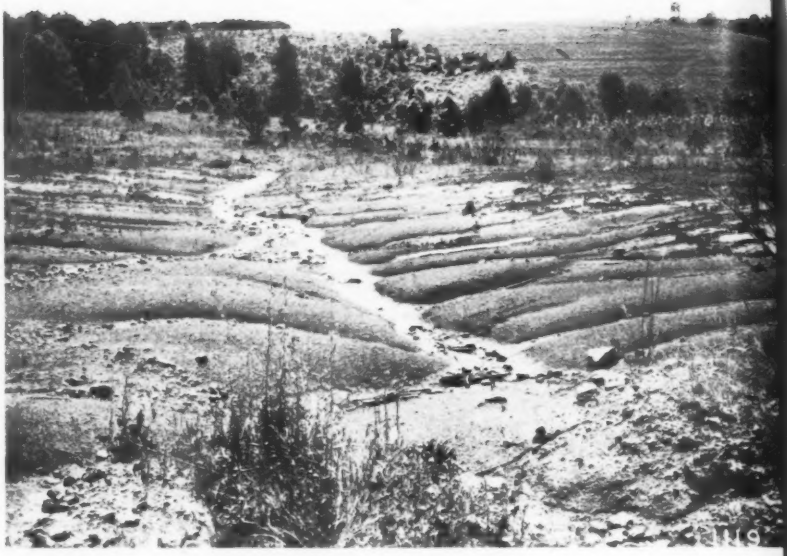
Dr. Sharpe shows how under natural conditions the rate of normal erosion is more or less balanced by the rate of soil formation; but when man clears the covering of vegetation, the normal processes of erosion by wind, rain, and running water are accelerated to such a degree that soil formation can no longer keep pace with them. In humid areas, where the soil is kept damp by its covering of natural vegetation, the hills and valleys have the smooth curves with which we are familiar in Britain. If however the soil covering is exposed to the elements, they proceed to strip it, and the under-lying rock is left without protection and is carved into angular forms characterized by vertical and horizontal surfaces, such as are typical of arid regions. Thus, by careless farming, a local desert of "badland" topography may develop in an area receiving a good rainfall.

When heavy rain falls on the bare soil of a hillside, clay and silt are carried away bodily by the process termed sheet-wash, and are deposited elsewhere, sealing the pores of the soil so as to form an impervious covering which prevents drainage into the earth beneath. Such a process of sheet erosion is illustrated by a photograph taken in south-eastern Minnesota (Plate 1), which shows the difference between a tract of land clothed with grass and weeds,

1. C
Sou

1. Gullies developing in denuded field and threatening better farmed land. South-eastern Minnesota (1–184)

2. Gully in sandy loam. Spartanburg County, S.C. (S.C. 781–782)



3. Gully system developing, fed by parallel rills following old plough furrows. Spartanburg County, S.C. (1119)

4. Hillside soil, removed by rills and gullies, being deposited at foot of slope. Steuben County, N.Y. (36–293)

and one stripped naked by the trampling and rooting of pigs. In such a case the good farmer will suffer from the negligence of the bad farmer, for the rills and gullies developing on the bare land will, if not checked, eat their way back into the fertile land. Water, carving its channel in soft rock, is liable to undercut the banks, especially at the head, so that the sides of the rills cave in, and the incipient gully widens steadily.

Such gullies may look comparatively harmless at first sight, but Dr. Sharpe demonstrates the rapidity with which their channels may broaden until they are capable of engulfing whole villages, to say nothing of potentially productive land. Plate 2 shows a gully cut in sandy loam in Spartanburg County, South Carolina; it has been growing for nearly a hundred years and parts of it are now 30 feet deep. The chief cause of its rapid enlargement here is the fact that drainage from a highway enters the head in the foreground.

Preventive measures should be taken to control the development of the rills in their earliest phases (Plate 3). This can be done by filling in, and by cultivation of the land and replanting the surface, although it is sometimes necessary to construct dams to control the flow of water. When once a large gully has developed, its control is a very difficult process. It may be possible to grade the sides and stabilize them by plantation, but in many cases the condition is practically incurable and the gully will continue to develop until it attains the scale of a canyon. Dr. Sharpe concludes dramatically with photographs of the canyons of the Yellowstone and Colorado rivers, pointing out that these must have originated as gullies similar to those which are now dissecting the ordinary farming lands of the United States.

Plate 4, showing a hillside in western New York, illustrates the bodily removal of the soil by rills from the light-coloured strip (planted with buckwheat), and the deposition of a fan of sand and gravel by the principal gully traversing the slope. The fields here are suffering denudation while their products are threatening to overwhelm the barn below. Whole surface areas of a hillside may thus subside towards the valley, with disastrous consequences to the agricultural value of the land. If the proportion of water is great enough to reduce the moving mass to the condition of mud, the rate of subsidence may be so much increased as to constitute a serious danger to roads and buildings.

In arid land, wind erosion is an agent as destructive as running water. In the "dust-bowl," sand and soil are carried away together, leaving desolation behind and bringing desolation when they are dropped again in the form of dunes which may encroach on fertile and inhabited country.

Dr. Sharpe stresses the point that in drier territories the hill-slopes which suffer worst are those which face south and which receive the full sun. In winter the snow is thus melted too rapidly to soak the soil adequately, and in summer the vegetation is dried up by the heat of the sun. These southerly slopes are therefore barer and more arid than the northern, and so more subject to erosion.

Apart from such natural causes, certain agricultural malpractices predispose land to gullying. Too intensive clearing deprives the soil of its natural protection, and the removal of the binding vegetation from stream banks leaves them at the mercy of the water. Overgrazing and trampling render

the surface still more vulnerable. In arable land, the principal fault lies in ploughing up and down the hill-slopes, thus providing ready-made water-channels, which may be avoided by contour-tilling. By intelligent precaution, it may often be possible to prevent the insidious rills from ever appearing; when once they have begun to develop their control becomes progressively more difficult. Dr. Sharpe stresses the need for large-scale co-operation among all those who are responsible for the land, and who must possess and apply a knowledge of natural processes if they are to do their duty by their heritage.

I am indebted to Dr. Sharpe for permission to give an account of his pamphlet, and to the United States Soil Conservation Bureau for the photographs reproduced (the negative reference numbers are given after the title); those in Plates 1 and 4 were published in 'What is soil erosion?'

SEVENTEENTH-CENTURY DUTCH CHARTS OF THE EAST INDIES

G. R. CRONE

IN 1934 M. Marcel Destombes began the ambitious task of compiling a catalogue of all nautical charts produced before approximately 1700. He has had, as a naval officer, opportunities of examining many collections in various countries, and has thus been able to check and augment the lists of other students. At the International Geographical Congress, Amsterdam, 1938, he explained to those interested the arrangement and progress of his work. The last news of him was received from Saigon, and there is unfortunately reason to believe that part of his material may have been destroyed. A section of it however was published at Saigon in 1941, and through the courtesy of Dr. A. Cortesão I have been able to examine a copy. The title of this monograph is 'Cartes hollandaises: la cartographie de la Compagnie des Indes Orientales, 1593–1743.' Before referring in detail to this section, some indication of the scope of the whole work may be given.

The limiting date of 1700 was adopted as dividing the period of discovery and exploration from that of the revolution in cartographical technique which took place in the eighteenth century. To make his task more manageable, and because he believes them to be in general more important, he limits his catalogue to charts drawn on parchment, though he recognizes that for a comprehensive history of cartography those drawn on paper and also printed maps must be considered. All general maps of the world, such as those found in the various manuscripts of Ptolemy's Geography are excluded, as embodying on the whole material taken from earlier charts, as also are charts by non-European cartographers. Submitting these charts to a critical examination, particularly with regard to the style in which they are executed and the habits of copyists, he proposed to classify them in chronological groups, and thus to determine the course of development, and the genuineness or otherwise of doubtful items.

The catalogue of Dutch charts shows the thoroughness with which the

work was being done: of the two hundred and seventy maps included he had examined about two hundred and fifty. Each entry includes a brief description, a list of bibliographical references to earlier literature, and the present home of the chart. The period covered in this monograph coincides with the initiation and expansion of Dutch overseas enterprise: the charts are those prepared by their official cartographers for the long sea voyages promoted by the Dutch East India Company. Prominent among these cartographers were Cornelis Doedts, Joris Carolus, Hessel Gerrits, W. J. and J. W. Blaeu, and Isaac de Graaf. Much of the information on these charts did not appear on printed maps until later, from a natural reluctance to impart it to possible competitors. In the early period the charts cover many parts of northern Europe, the oceans, and the Americas; later they are concentrated on the route round the Cape and on the Far East, most of the basic charts having been established by J. W. Blaeu.

During his investigations, M. Destombes examined, and included in his list, a set of Dutch charts, drawn on parchment, in the Society's collections. These nine charts, with two others having apparently no connection with them, were presented to the Society about 1870 by General Wetherall, and there is now no record of their earlier home. Others of a similar type are in French and Netherlands Libraries, in the British Museum, and at the School of Geography, Oxford, on loan from Corpus Christi College. These last are thought to have been presented to the College by William Halifax early in the eighteenth century.

The whole group is tentatively dated by M. Destombes at *circa* 1695, and for reasons discussed below, he provisionally concluded that they were the work of a copyist, probably French, at Batavia. As the Society's charts have not been described in detail, and further examination seems to reveal reasons for modifying some of M. Destombes' tentative conclusions, the following notes may be of interest.

In this list I have added the numbers assigned to them by him (D.) and references to Dr. Wieder's 'Monumenta cartographica,' vol. 5 (W.)

Seventeenth-century Dutch Charts in the Collection of the Society

1. Chart of the Atlantic, western coasts of Europe and Africa, and of South America from Guiana to Rio de la Plata. 72×93 cm. 1° of latitude = 11 mm. Shows limits of best courses in equatorial latitudes. A few Dutch names. D. 151; prototype J. W. Blaeu, *c.* 1655.
2. Red Sea. 76×93 cm. 1° about 430 mm. Names very mixed, some Dutch. D. 154.
3. Malabar; Goa to "Calculan" (? Kayankulan). 72×96 cm. 1°=136 mm. Names, some Dutch, neatly written, with small drawings of buildings, trees, and hills: soundings, with indications of anchorages and reefs. D. 159. W. p.188, 26.
4. East coast of India, "Adams Brugh" to "Siekiekoery" (north of Pulicat). 70×95 cm. 1°=192 mm. Similar in style and writing to No. 3. D. 161.
5. Gulf of Tonking, Hainan, and coast of China to Pescadores. 74×99 cm. 1°=66 mm. Many Dutch names and sailing directions along coasts; reefs and shoals indicated, but no soundings; a few buildings and hills. D. 164; prototype Anon. "I.N." 1658. W. p.193, 14 is on same scale, but differs slightly in area.

6. Pescadores and part of western Formosa. 68×80 cm. No scale or degrees marked; about ten times scale of No. 7. Names, etc., in Dutch; soundings and reefs. D. 165. W. p.192, 9 on approximately same scale.
7. Part of coast of China, Formosa, and south-west Japan. 80×101 cm. 1°=65 mm. Some names and indications in Dutch: a few reefs and shoals, and soundings in limited areas. D. 166; prototype J. W. Blaeu, *c.* 1655, on same scale, which is larger than W. p.193, 25.
8. Java Sea, including east coast of Sumatra, Java, south-west Celebes, southern Borneo. 72×94 cm. 1°=65 mm. Many Dutch names, some soundings and shoals. Island names in capitals added later. D. 172, prototype Hessel Gerrits, 1628, which is on same scale, as is also W. p.189, 20.
9. Timor, Celebes, Halmahera, and Ceram. 72×94 cm. 1°=65 mm. Some Dutch names, no soundings. Style of writing appears to differ from No. 8. D. 173, prototype Anon., *c.* 1663. W. p.190, 1, is on same scale though covers slightly different area. Both have north coast of Ceram drawn in profile.

None of the R.G.S. charts has a title, date, or name of a cartographer. Most however have with slight variations a similar compass rose in red and blue, resembling those found on charts by J. W. Blaeu, scales of degrees and of miles in red, blue, and white, and some variant of the legend "Duytsche mijlen viffthien voor een graet." On all the charts with one exception (No. 6) the general names of countries and islands are written in different styles from those of the smaller place-names. In some cases they have plainly been added later, on the others the penmanship is not as fine as on the charts themselves and appears to be of later date.

These general resemblances led M. Destombes to believe that this group of charts is the work of one copyist who followed older models; he also concluded that this copyist was probably a Frenchman because he thought he could detect certain Gallicisms (No. 2 has "Le mair rouge").

An examination of the R.G.S. charts leads to a rather different conclusion. In the first place it seems quite clear that apart from the general names mentioned above, they are the work of several hands. Much of Nos. 1 and 8 shows considerable similarities. The writing on No. 2 does not bear much resemblance to that on any of the others. Nos. 3 and 4 are in the same hand, which resembles, but is not identical with, that on Nos. 5 and 7. It seems reasonable to conclude therefore that at some time the charts were brought together and provided with general names and perhaps, also, more or less uniform compass roses and scales. As to traces of Gallicisms, No. 2 is the sole chart to have anything that might be thought to show French influence, and even here it is doubtful whether the corruptions are French. As this chart differs so markedly from the others, and presents problems of its own, it is omitted from the following discussion.

If the charts are primarily the product of several cartographers and not of one copyist, it is of interest to attempt to establish their origin and dates. M. Destombes placed the whole group provisionally at *c.* 1695: though he recognizes that their internal character might suggest an earlier date, he considers this unlikely. If such charts had existed earlier in precisely this form, he thinks that others modelled upon them would certainly be found among

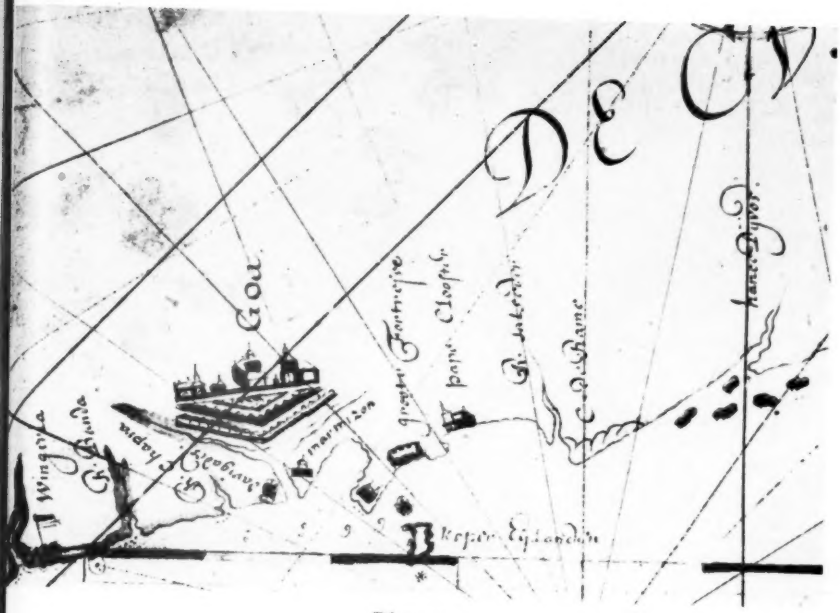


Plate 1

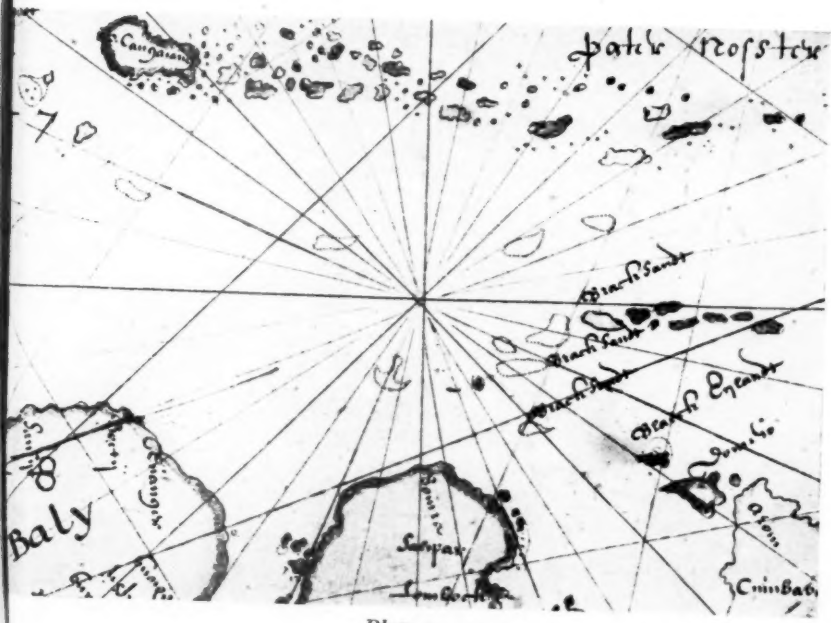


Plate 2

I. FORMOSA
Groene hoeck
R. van ponekam
R. van matsau
Wanckam
Wanckam
R. Sinekan
Tayowan
Tamay
Tamay
Tamay

the productions of J. W. Blaeu, the official cartographer of the Company. As he has found no such charts which can be definitely assigned to J. W. Blaeu, he concludes that this collection must be later than Blaeu. There are however reasons for rejecting this view of their dates. In the great collection of maps formed by L. van der Hem as a supplement to the eleven volume edition of Blaeu's atlas, which Dr. Wieder calls the "secret atlas" of the East India Company, there are charts drawn on paper which, from Dr. Wieder's description of them, resemble very closely these parchment charts. M. Destombes does not of course include the latter in his list, as he confines it to those drawn on parchment.

The chart of the Gulf of Tonking (No. 5) is represented in the van der Hem collection by one on the same scale covering practically the same area but with more information upon it. No. 6, the Pescadores, is on approximately the same scale in both cases, though with fewer soundings on the R.G.S. chart. The China coast and Formosa, No. 7, though on a slightly larger scale, and having soundings on it, covers much the same area as the van der Hem copy. Both Nos. 8 and 9 are on the same scale in each set and of virtually the same areas, No. 8 also having the north coast of Ceram drawn in profile, as noted by Dr. Wieder. In addition, the coast of Malabar (No. 3) seems also to occur in the van der Hem collection, though Dr. Wieder does not give the scale of the latter.

As Dr. Wieder concluded that the van der Hem collection was put together about 1670, it is clear at least therefore that charts of these types were current before that year, and, in the absence of definite evidence that they are copies, there seems no reason against assigning the R.G.S. charts to a slightly earlier period. From internal evidence the earlier limiting dates can be determined approximately for some of the R.G.S. charts.

On the chart of the east coast of India (No. 4) the name "Hammenhiel" is given to a small island off the north coast of Ceylon. During the period of Portuguese occupation this was known as St. Francisco and the change was made after the Dutch had captured the island in 1658. Similarly the indication of Negapatam as a Dutch station must be later than that year.

The absence from No. 7 of the name "Zeelandia," as the Dutch called their stronghold at Taiwan, Formosa, and the concentration of detailed soundings around the northern end of the island suggests that the chart in this form was produced between 1661, when Zeelandia was abandoned, and 1666, when attempts to establish a foothold in the north were given up.[1]

It is noticeable that the dates of the prototypes assigned to two other charts by M. Destombes (Nos. 1 and 5) are also about the same period, namely *c.* 1655 and 1658. Details on the China coast on No. 5 show that it does not include information obtained in 1661.[2] No. 8 is certainly much later than its prototype. The representation of the southern coasts of Borneo is much better than that on the map of H. Allardt, based on charts, which was published in 1652. The resemblance between the writing on this chart and that

[1] The information in these two paragraphs is drawn from F. W. Stapel, 'Geschiedenis van Nederlandsch Indië,' vol. 3 (1939), 317, 371.

[2] There is a brief reference to a Dutch visit to "Bredans eyland" in 'Dagh-Register gehouden int Casteel Batavia. . . . anno 1661,' under 11 December.

on No. 1 also seems to point to a date about 1655. It seems reasonable therefore to assign this group of charts approximately to the period 1655–70.

Certain features on them suggest that they are not merely copies of older charts, but may have actually been used by pilots to record their observations. Although they cover large areas, soundings, if given, are generally restricted to a relatively small portion of the chart, and are often very numerous. Those to the north of Formosa have already been mentioned. On the chart of the Java Sea, No. 8, they are confined to the coast of Borneo and across to, and off, Macassar; on No. 9 they are mostly off the south-west coast of Celebes. In some cases the parchment in these areas is rubbed and worn. This suggests that the charts were in actual use to record the observations made on particular voyages. The written indications on the chart of the Gulf of Tonking appear to have been made at different times, and in some cases the direction lines have been scraped away where they are written. One group along the coast of Tonking is quite detailed: "Koa Nahum wort bei de Portugezen Bevaarden ende genaemt arcarom de bequaemste om uijt en In te Zeijlen om de mercken aen den Thoorn op t hooge Landt. Is met een Spring stroom stijf 8 vadem slick grondt." (Koa Nahum is visited by the Portuguese and by them called Arcarom. To sail in and out most conveniently, mark the tower on the high land. With a spring tide there is eight fathoms, muddy bottom.) "Koa Duyban omtrent 13 voet waters Is goet uijt te Zeijlen. maer quaet in te komen. alsoo men buytten de bancken geen lant ofte mercken Zien kan. Tusschen de bancken ist nau ende met de Noorde wint veel dizich weder." (The estuary of the Thai Binh, about thirteen feet water. Is easy to sail out of, but bad to enter. Also outside the banks one can see no land or marks. It is narrow between the banks and with the north wind much drizzling weather.) Elsewhere on this chart the legends are shorter: *e.g.* "De Hoeck van Archipelagus [1] hijer is het al droogh dubbelt gehackelt Lant." (Here it is all shallow, exceedingly broken land); "verthoont zigh als veel Eijlanden als men uijt t er Zee kompt." (This appears like many islands when approached from the sea.) "Koa Goock Is buijten droogh derhalven onvaerbaer als met Cleijn vaertuijgh." (Koa Goock. It is shallow outside, therefore unnavigable except for small vessels.) "Al hijer geen lant gezien." (No land seen here.)

These considerations suggest therefore that these charts may have been used to record the observations of captains and pilots, and the fact that charts of the same areas on similar scales exist, but with varying information upon them, also suggests that the charts were standard ones used for this purpose. This was in fact the procedure of the East India Company. In this connection Dr. Wieder quotes the inscription on C. J. Koen's chart of the China Sea, 1654, which states that it shows ". . . all their capes, bays, rivers and islands, depths and shoals, brought together on individual small maps, as well as from the writings and annotations of several experienced captains and pilots, through which the Company's charts are cleared of many mistakes."

Assuming that these charts were made for the Company approximately during the period 1655–70, the question of the cartographer or cartographers responsible for them remains to be settled. The first to occur to

[1] A cape in the neighbourhood of Hongay, north-east of the Red river delta.

one would be J. W. Blaeu, who was the official cartographer from 1638 to 1673. M. Destombes rejects this supposition with emphasis. Without a close comparison with charts which are accepted as his work, and this is not possible at present, this point cannot be cleared up. However it is known that Blaeu employed several draughtsmen in his office, and perhaps the charts are to be attributed to them, rather than to Blaeu himself.

Notes on the Illustrations

Plate 1 is a portion of No. 3, with the names in a neat, cursive hand. It includes the beginning of the general name "De Cust van Canaryn," in a different style, which was added after the compass rose had been drawn.

Plate 2 is from No. 8, and includes the north coasts of Bali, Lombok, and Sumbawa, and the Pulo Tengah, or Paternoster, islands. P. Cangaiang in the top lefthand corner is Kangean island. The lettering is in general smaller and more gothic in character, particularly the capitals, than that of Plate 1. Although the outlines on this section are rudimentary, the relative positions of several points and islands are correct. The scale of latitude is displaced about a quarter of a degree southwards.

The lettering on Plate 3, Formosa from No. 7, resembles that on Plate 1, but is not identical in all details. It may however be the work of the same draughtsman. The general representation of the island is fair, apart from the conventional exaggeration of river mouths and harbours, and the latitudes are correct within 5′.

REVIEWS

EUROPE

LES RELATIONS COMMERCIALES DE LA FRANCE. By JEAN GOTTMAN. (Collection 'France Forever.') *Montreal: L'Arbre*, 1942. 8×5 *inches; 212 pages*

M. Gottmann summarizes lucidly the international trade relations of France before 1939, with some cogent reflections upon world trade in general. He does not hesitate to record shortcomings where these emerge from his analysis, and thus indicates the directions in which future reorganization should proceed. Though the two historical features, specialized production and universality of commerce, have been maintained in a lesser degree, a marked trend since the later decades of the last century has been the relative decline in manufactured goods among her exports. The balance between the various branches of production, rendering her economy generally more stable than that of other Western European countries, combined with small-scale specialized production, handicapped her participation in modern total and industrialized warfare. One weakness which is examined in detail was the neglect of her shipping. The relations with the overseas colonial empire as a complement to domestic production is also discussed. On international trade in general a contrast is drawn between the stable economy of France and Germany's striving for self-sufficiency combined with an insatiable demand for external markets. As an introduction to the study of French commerce, this monograph can be warmly recommended. G. R. C.

ASIA

TRAVELLER FROM TOKYO. By JOHN MORRIS. *London: Cresset Press*, 1943. 8×5 *inches; 164 pages. 10s 6d*

Mr. Morris's book is remarkable for two things: he has dared to see points in an enemy and he has actually indulged in witticism at the expense of those of an opposed ideology. In this age of pseudo-religious state-worship (a vice which finds its most elaborate expression in Japan), when other countries are seen with the eyes of a misplaced faith as either jet black or pure white and when jokes at their expense are therefore rigidly excluded, Mr. Morris had the temerity or the honesty to see Japan grey and to find it on occasions funny. By so doing he has vindicated the Englishman's traditional attitude to foreigners and their ways, which partisan prejudice, wishful thinking, and inspired ignorance bid fair to destroy. Mr. Morris lived for four epoch-making years in Tokyo; he looked Japan fairly and squarely in the face, picked out the good for commendation, and reviled the bad.

Four years is not a long time in which to study so alien and so baffling a civilization as the Japanese; but the result of four years' study is probably as much as the average reader can well assimilate at a sitting. It is the great merit of 'Traveller from Tokyo' that it sets out only to record the impressions of a sensitive, cultivated, and experienced mind. It is a most honest account which gives the newcomer to Japanese problems the clearest picture of contemporary Japan yet produced. The intelligent reader may meet Japan for the first time in the company of one doing the same thing; he progresses in his understanding of the enigma with the progress made by the author. Here are no conclusions reached after years of meditation thrown out to perplex the

reader; here is gentle progress to as good an appreciation of the worth of contemporary Japan that a gifted personality can make in the time.

Perhaps four years is sufficient, particularly if spent in such employment as adviser to the Japanese Foreign Office and professor in a university. It is enough to gain a keen insight and not sufficiently long for the keenness to be blurred. Within the limits set by the author there is nothing vital with which to disagree. There is a suggestion, reinforced by the observation that spoken Japanese is not after all so difficult, that the author was not quite at ease in Japanese conversation; a certain roughness ensues which a deeper insight into the genius of the language might have obviated. His conclusions with regard to modern Japanese painting, the drama, and Japanese students are worthy of respect; it is not necessary to agree with them. A visit to the Royal Academy is sufficient to evoke a positive longing for the vitality and vigour—and the crudity and naivety—of modern Japanese oils. A greater appreciation of form and colour might have helped the author to greater appreciation of the classical drama (Kabuki and No). The reviewer, having had dealings with French, German, Italian, American, Japanese, and English students, finds a remarkable similarity between youth the world over except for those with privileged backgrounds. He has found the same initial shyness, succeeded by awkward jumps at bridging the gap and settling down into pleasant give and take. This leads to one omission in the author's otherwise catholic experience: the Japanese insistence on the gap between persons other than members of the same family. Some rationalization of this is necessary to explain Japanese gaucherie and the difficulties of social intercourse. But to explain all would be to condone more than is healthy. Mr. Morris is not able and does not set out to do this; his book gains thereby. It should be read by all desirous of penetrating into the mystery of Japan. Mr. Morris has borne in mind la Rochefoucauld's wise maxim: "Le plus grand défaut de la pénétration n'est pas de n'aller point jusqu'au but, c'est de le passer." He reaches the point pleasantly and amusingly, although his jokes must be viewed in perspective. Perhaps he does not quite bring out with adequate emphasis that Japan is a tribal civilization, sufficient unto itself, with no thought of a universal scale of values, no conception of justice applicable to all, and with no experience of being a nation among nations. For this her history and isolation are much to blame. Military defeat should destroy her Herrenvolk obsession. To the Japanese what succeeds must be "following the will of the Emperor," what fails is to them obviously "going against the will of the Emperor." It is up to us to prove to them that military aggression has failed and that their peacetime achievements—fruits of their craftsmanship and industry—on the other hand did succeed. To all engaged in this task Mr. Morris's book is of the greatest possible value and deserves the widest publicity.

J. P.

AUSTRALASIA AND PACIFIC

TRAIL OF THE MONEY BIRD. By DILLON RIPLEY. *New York: Harper Bros.* (1942). 2nd edition. 9×6 *inches;* xii+206 *pages; illustrations and end-paper sketch-maps.* $3.50

In December 1936, Dillon Ripley, a young graduate of Yale and an enthusiastic ornithologist, set sail from Philadelphia in the 60-foot schooner *Chiva* for New Guinea, to collect birds and other zoological specimens for the Museum of the National Academy of Sciences at Philadelphia. The ship's company consisted of seven, two women and five men, all more or less amateurs in sea-faring.

The first part of this volume records their adventures in lively fashion. It took them ten months to reach their destination owing to trouble with the

Diesel engine which necessitated long waits at various ports for spare parts; when they reached Tahiti the whole of the stern of the schooner was found to be soft with dry rot, which caused a long stay for rebuilding. At last they reached Sarong, the chief settlement at the western tip of Dutch New Guinea and Ripley set to work at his collecting. He visited the islands of Biak, Misol, and Salawati, and also other smaller islands off the coast of the Vogelkop, the western extension of New Guinea.

On the mainland he made two expeditions, one with the Dutch Controleur, Mr. van der Goot, and one by himself, when he managed to reach an elevation of 5200 feet in the Tamrau range, and camped there for sixteen days, obtaining a good series of bird skins from a locality never visited by a collector.

His mother came out subsequently from the States, and accompanied him home on a freight steamer from Java direct to Boston together with a large cargo of live birds and animals for the American Zoological Gardens.

The scientific results of the expedition were published in the *Proceedings of the National Academy of Philadelphia* for 1939. The present volume in lighter and livelier style gives us an account of his personal adventures, and contains many good stories of the varied types of humanity, from beachcombers to Papuans, which he encountered; it is excellent reading and, although not published in England, appears to have reached a second edition in America. A map printed on the end covers is perhaps sufficiently adequate to follow the route though not of any geographical value. The volume is illustrated with a number of photographs all bound together in the middle of the text, an uncomfortable arrangement for the reader. The reviewer thoroughly recommends the volume to those interested in the islands of the Pacific Ocean. W. L. S.

PHYSICAL AND BIOLOGICAL GEOGRAPHY

CLIMATIC ACCIDENTS IN LANDSCAPE-MAKING. By C. A. COTTON. *Christchurch, N.Z.: Whitcombe and Tombs*, 1942. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xx+354 *pages; illustrations, sketch-maps, and diagrams.* 30*s*

This book deals with the morphology and origin of land-forms occurring in dry and dry-seasonal climates in part one, and in cold and snowy climates in part two. The purely descriptive paragraphs of the text in the former deal adequately with the mountain comb, its glacis and the basin below, though not without introducing names for most conceivable varieties of form which may develop. Many other paragraphs are devoted to possible explanations of why such features may be there. A chapter is alloted to those curious plains in Africa dotted with inselbergs, and it is followed by another which deals with the rather flatter surfaces called savannahs. The last chapter of the part is on sand-dunes. In the second part Professor Cotton writes again what has often been written before about glacial and allied features and contributes a readable chapter on the old controversy of glacial protection. He boils with indignation at what he calls the tectonic theory of fjords, quite the liveliest page in the book. Line sketches are dotted through the text and many photographs from various countries form a picture supplement. The index is satisfactory. J. V. H.

ERUPTIVE ROCKS; their genesis, composition, etc. By S. J. SHAND. 2nd Edition. *London: Thomas Murby*, 1943. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xvi+444 *pages; frontispiece and diagrams.* 25*s*

The appearance of a second edition of Shand's 'Eruptive Rocks' is a great event for geologists, and the book is so well written, so rich in common sense, and so stimulating, that many geographers will find instruction and perhaps delight

in its logic and arresting opinions. Spectators too often enjoy a dog fight, and few inexact sciences have afforded more undignified wrangles in the last few years than petrology. This book is so different from the first edition that it might have had a new name. It views undisturbed the raging conflicts around and calmly reveals how much there is to be said on both sides.

The first ten chapters lead on from definitions over a course where physics and physical chemistry serve as willing aids in marshalling the materials making up eruptive rocks. Then in chapter eleven the author outlines a very workable system of petrography which provides concise labels which can be attached to existing names. The latter are often so ill-defined that they mean many things, but long usage makes it inexpedient to drop them. In the circumstances this addition of a simple tag is the best that can be done to modify the historic names discreetly enough not to offend susceptibilities and yet to give them some sort of systematic value.

Geographers may feel that eruptive rocks are too remote from their pursuits to be considered, but many attractive landscapes of the earth's crust are chiselled out of them. This book inflicts no detailed study of particular cases upon the unwilling reader, but presents a conspectus of the controlling features of a wide field of knowledge more clearly and in simpler language than has ever been done before. J. V. H.

TRES ESTUDIOS REFERENTES A LA OCEANOGRAFIA DEL PERU. By ERWIN SCHWEIGGER. *Lima: Libreria e imprenta Gil*, 1943. 10×7 *inches;* 64+95+29 *pages; diagrams and sketch-maps*

The volume contains three papers which continue the author's earlier reports on the Humboldt current. The first, reprinted from the *Boletín de la Sociedad Geográfica de Lima*, deals with the correlations between sea temperatures and meteorological observations at Puerto Chicama; the second, which appears for the first time, is a study of the Bay of Pisco, and the third, reprinted from the *Boletín de la Compañia Administradora del Guano*, is a similar account of the Bay of Chimbote. The three localities lie between latitudes 7° and 14° S. in the centre of the Peruvian guano industry.

Now that the old deep beds of guano, which covered the islands lying off the coast like the ice-caps of low Antarctic islands, have been mostly removed, the production depends on the cleaning off, every few years, of the large deposits left by the innumerable Boobies, Cormorants, and Pelicans which still frequent the islands. An artificial ecological balance is maintained, but it is sensitive to fluctuations in the number of nests, in the time spent on the nests, and to the general well-being of the birds. The oceanographical factors which influence the abundance and distribution of the small fish on which the birds mainly feed are of some importance, and meteorological factors have several direct and indirect influences.

Dr. Schweigger is commissioned by the Compañia Administradora del Guano to study such problems, and among much preliminary material it is shown that the guano production falls after an invasion of the region by the warm *El Niño* current, and also that there is evidence of a relation between the average wind direction of one year and the production of the next; a small change in the westerly direction causes a considerable fall in production.

In the report on conditions at Puerto Chicama the author reviews meteorological and sea temperature observations made daily at 08.00 and 16.00 since 1925. The measurements are not of the very highest standard but they are adequate for comparison with sea conditions. The author is careful not to attempt to make detailed predictions of conditions on the open coasts from his

observations in sheltered bays, but there is some significant relationship between them. They show that the year 1931, when the late E. R. Gunther investigated the oceanography of the Humboldt current in the Discovery Committee's vessel *William Scoresby*, was one of attempted warm-water invasion, though its consequences were not as serious as those of the disastrous invasion by the warm El Niño current in 1925.

Conditions in the Bay of Pisco are illustrated by sketch-maps of the surface temperature distribution. They emphasize the earlier conclusions that the Callao–Pisco region is not one of the most active cold-water areas; the water is several degrees warmer than it is off San Juan, 100 miles farther south, and slightly warmer than the coastal water off the northern part of Peru. In each of these areas the northward current is stronger, and there is more upwelling of cold water. Dr. Schweigger places more emphasis than earlier writers on the effect of a greater prevalence of onshore winds in the Callao–Pisco region.

Along the shore of the Bay of Pisco the water is generally warmer than the offshore current, because of the influence of the shallow beaches and rivers, and its more sheltered position. In the offshore current the temperature varies from season to season, and also depends on the strength of the northward movement from the colder San Juan area, and on occasional invasions of warm water from the north-west. The conditions are most complex in the month of January, when all the contributory factors are less stable and the area is most threatened by the southward movement of warm water. The discussion emphasizes the difficulties which attend the detailed investigation of a current boundary, and in this case Dr. Schweigger was handicapped by having no salinity measurements.

In the Bay of Chimbote a closer examination was made of the marine fauna, which proved to have a great variety of species, though the total numbers were relatively small. The low productivity of the bay is attributed mainly to its shallowness, though it is supposed that some of the shortage may be due to the present and previous activity of seals and dolphins. G. E. R. D.

AN INTRODUCTION TO HISTORICAL PLANT GEOGRAPHY. By E. V. WULFF. Translated by ELIZABETH BRISSENDEN. (New series of plant science books, vol. 10.) *Waltham, Mass.: Chronica Botanica Co.*, 1943 (*London: Wm. Dawson*). $10^1/_2 \times 8$ *inches;* xvi+224 *pages; diagrams.* $4.75

Since the time of Alphonse de Candolle it has been generally recognized that the distribution of plant species in a country or over the earth cannot as a rule be entirely explained by the conditions at the present day; plant distribution is determined on the one hand by ecological factors, climate, soil, and competition with other plants and animals, on the other by historical factors such as the age of the species and changes in the area of land and sea. Some plant geographers have laid exaggerated emphasis on the ecological factors, others on the historical. To some, for instance, the peculiar flora of Teesdale can be accounted for mainly by the unique combination of conditions operating at the present day: special climatic conditions and the occurrence of the "sugar limestone". To others the fact that Teesdale was unglaciated when most of the surrounding country was under ice seems much more important.

Dr. Wulff's extremely interesting book, without altogether leaving out the ecological factors, is concerned chiefly with the historical side of plant geography, a subject which has been much neglected in England in recent years, though British sudents such as Forbes and J. D. Hooker have made fundamental contributions to it in the past. The author gives a clear and straightforward account of the subject. Its appearance at the present moment is

particularly opportune, as the impact of other subjects, particularly cyto-genetics and experimental taxonomy, is likely to stimulate plant geography into a new and fruitful period of development. The eleven chapters deal with the scope, methods, and aims of historical plant geography, the history of the subject, the different types of plant areas, their boundaries, centres, and origins, the parallelism between plant and animal distribution, the distribution of plant parasites and their hosts, the natural and artificial factors affecting the spread of plants, the migrations of species and floras, floral elements and the historical causes for the present composition of floras. In the course of this broad survey many subjects of great interest both to botanists and geographers are discussed. The author's well-balanced judgment is shown in his handling of such controversial subjects as the Age and Area theory of Willis and the recolonization of Krakatoa. On the Wegener theory of Continental Drift, of which he is an enthusiastic upholder, his attitude is rather less judicial. References to literature are full and a particularly useful feature is the large amount of Russian literature, otherwise almost inaccessible to British workers, which is summarized. The translation is perfectly clear and sufficiently readable.

The author of this volume, who was until recently Curator of the Herbarium in the Department of Geography of Cultivated Plants, Institute of Plant Industry, Leningrad, is already known in this country for his work on the plants of the Crimea. While the last sheets of the English version of his book were being printed, news of his death from a shell splinter in Leningrad was received. The book under review was planned as the first of three volumes on plant geography. It is understood that the second part, dealing with the history of the floras of the world, and at least part of the third, dealing with the effects of man's activities on floras, have been completed, and it is to be hoped that they too may be made available to the English-speaking public.

P. W. R.

GENERAL

RETURN TO HAPPINESS. By JONAS LIED. *London: Macmillan*, 1943. $8\frac{1}{2} \times 6$ *inches;* xii+318 *pages; illustrations and map.* 18*s*

In 'Return to happiness' Mr. Lied tells the story of his life. He was born in 1881 near Molde on Romsdal Fjord, not far from Aandalsnes, and became for ten years a salesman of machinery first in Oslo, then in Cardiff, Aachen, Berlin, and Paris. In 1910 a chance meeting with Mr. Alfred Derry turned him in a new direction, for Mr. Derry went every year to Nizhny Fair to buy Siberian furs and was obsessed by the idea of opening up direct communication with Siberia via the Arctic and Kara Seas and the Ob' and Yenisei rivers, as this had already been attempted on a small scale by Captain Wiggins. Lied was so much infected by Derry's enthusiasm that he went out to Krasnoyarsk, which at that time was still a somewhat primitive outpost town on the Yenisei, which flows from there 1600 miles to the Kara Sea. The rich possibilities of Siberian trade were apparent, if only regular water communication could be established.

The Siberian Steamship Manufacturing and Trading Company was formed in Oslo in January 1912 with Norwegian and British capital, and in that year a whaling and cargo ship was chartered to take out a cargo and bring back goods that had been purchased on the Yenisei. The captain would not face the ice floes however and the ship returned to Norway. The next year a larger vessel, the *Correct*, was chartered, and Lied not only went with it, but he also induced Nansen to accompany the expedition. This time the voyage was highly successful. The business soon began to boom, and in order to be able to control the river traffic on the Ob' Lied became a Russian citizen. In 1914 a whole flotilla

made the journey, and navigation was becoming easier with experience and with the help of the wireless stations which had been erected by the Russian government.

The Siberian business flourished in spite of, or because of, the 1914–18 war. The author was appointed Norwegian consul for Siberia. Two more steamers were purchased, both of which were eventually torpedoed; and a saw-mill and a shipbuilding yard were started on the Yenisei. In 1917 it was intended that Theodore Roosevelt should travel out with the Kara Sea fleet, but while Lied was in America about this, the Russian Revolution had broken out, and soon afterwards America was in the war. In May the author returned to Krasnoyarsk via Japan and Vladivostok to find that matters had not yet altered much on the Yenisei. As nominal owner of the principal fleet of river steamers he acted as host at the annual blessing of the waters, but this was the last time that the ceremony was performed; when the ice broke up the next year conditions were very different. But 1917 was not a good year for the Kara Sea route; the only ship that attempted it was held up by a general strike and could not complete the voyage. The cargo was discharged at Archangel, and on the return journey the ship was sunk. All the property of the Company was confiscated by the new government, but Siberia was held for a time by Kolchak, and Lied was still fascinated by the country and especially by the Kara Sea route.

From 1920 onwards Lied tried hard to do business with the Bolshevik government, but with only slight success. In 1922 the New Economic Policy seemed to open up prospects, but when it had served its purpose it was reversed. The government had resolved that it would develop the Kara Sea route itself, and did not want to have it dominated by Lied. Eventually he became interested in Siberian bauxite and the manufacture of aluminium, and worked in conjunction with the Aluminum Company of America. They were not allowed to erect plant in Russian territory, but much trade with the Soviet government resulted. He was able eventually to leave Russia and resume his Norwegian nationality. In 1932 he came to the rescue of a cousin who was forced to sell his farm at Romsdal; Lied put fresh capital and enterprise into it while preserving as far as possible its traditional Norwegian character. He seems convinced that he is now really settled on his farm, although obliged temporarily to live elsewhere. "I was being led back all the while to my native Romsdal and happiness."

A. M.

THE MONTHLY RECORD

MEDALS FOR BRITISH GEOGRAPHERS

The American Geographical Society have awarded their Charles P. Daly Medal to Sir Halford Mackinder and their Cullum Geographical Medal to Mr. Arthur R. Hinks. These two awards are announced in letters from the American Embassy, enclosing others from Dr. Isaiah Bowman, President of Johns Hopkins University and since appointed a member of the United States' Advisory Committee on Foreign Policy. To Sir Halford Mackinder Dr. Bowman wrote: "It is with great pleasure that I inform you of the award to you by the American Geographical Society of New York, at its meeting of November 18, of the Charles P. Daly Medal. The Council of the Society has requested me, as Chairman of the Honors Committee, to inform you of the award. Dr. John Wright, the director of the Society, will be in communication with you about the arrangements for the presentation of the medal at London in due time. It would be superfluous to tell you in any detail of the reasons for this award. Your life has been filled with services to geography that can fairly be described as unique. We remember with particular interest and pride your magisterial work on 'Britain and the British Seas,' as well as your courage and foresight in publishing 'Democratic Ideals and Reality' at a time when the world in general was beguiling itself with the thought that we had concluded a war to end war."

To Mr. Hinks Dr. Bowman wrote: "In honoring you by the award of this distinguished medal, the Council had in mind your long and successful career as Secretary of the Royal Geographical Society and your work in the promotion of the professional interests of geography, especially in raising the standards of surveying and cartography. . . . The Council also had in view your devoted continuation in the Secretaryship of the Royal Geographical Society during the present war. . . . We hope that you will also regard the award of this medal as a further mark of esteem of the American Geographical Society for the Royal Geographical Society and for its splendid scientific traditions."

The President and Council of the Royal Geographical Society, greatly appreciating the high compliments paid to the Society and its Secretary, and to its past Vice-President, have directed that these be printed for the information of Fellows.

THE OTTOMAN TURKS AND THE ARABS

Illinois University has recently brought out a new volume in its series of Studies in the Social Sciences (No. xxvi, 4) entitled 'The Ottoman Turks and the Arabs, 1511–1574,' by G. W. F. Stripling, containing three coloured maps of the Levant. This book is a valuable study of a somewhat neglected period of the economic history of the Levant, the more important because that age of transition marks the decline in the wealth and culture of the Arabic-speaking lands and the beginnings of Occidental world supremacy. The author begins with a survey of conditions in the Arab countries anterior to the Turkish conquest which he then describes in detail, with particular attention to the administrative system set up in the newly conquered lands. A concise account follows of the dual purpose of Ottoman policy in the Red Sea and the Indian Ocean, the re-establishment of the Far Eastern trade of the Levant, and the destruction of the Portuguese stranglehold of that trade. The sources on which this study is based are mainly contemporary accounts in Portuguese, Spanish, Dutch, Italian, French, and English, along with some translations from Arabic, Turkish, and Persian, of which an ample bibliography is given. The picture

from the oriental side will not of course be complete until it is possible to study the native writers, but many of their works are still in manuscript, and translations of the printed texts hardly exist.

The author's main argument is that the decline of the Levant followed swiftly on the loss of the lucrative carrying trade between India and Europe, ensuing on the Portuguese discovery and exploitation of the Cape Route, concerted with their blockade of the rear of the Moslem world from the Indian Ocean. This blockade the Moslem powers were unable effectively to oppose, largely owing to the difficulty of equipping and maintaining a large fleet in the Red Sea and the Persian Gulf. Evidence is adduced to show that the Turks were less destructive than has been imagined, that they actually achieved a number of reforms of a constructive kind, and that, as a result of Portuguese activities, the Levant was already in decline before the Ottoman conquest. For instance travellers of the period before the Ottomans speak of the decaying cities of Alexandria and the Syrian coast-line, and it is possible that the ruined cities of the Aden coast, flourishing in Mameluke times, may have been abandoned with the loss of the Indian trade described in such detail by earlier authors quoted by Abu Makhrama, who even gives a tariff-list of Indian goods coming into Aden.

Some errors in detail should be corrected, as for instance Mutahbir (p. 99) should be Mutahhar. On the previous page the impression is given that the Zaidi Imams were usurping upstarts in the Yemen. This is hardly true for they had been ruling at Sa'da for several centuries before the appearance of the Ottomans in the country the sovereignty of which they had perpetually disputed with the previous dynasties; the Zaidi Imams are in fact the present ruling dynasty. In the maps most of that part of Arabia marked as belonging to the Ben Jabar is almost uninhabited and generally known as the Empty Quarter; it would have been advisable to indicate this on the map. The transliteration is not very satisfactory, and Dhofar for instance would be better written Zafar.

In general, a mass of information has been carefully collected, collated, and built into a picture of the early sixteenth-century Levant, most enlightening, for it sets the stage for the events of the next four centuries which are, to a large degree, the story of the slow re-emergence of the Arab spirit from the decay of the late Middle Ages. R. B. S.

NOTE ON KILWA, TRANSJORDAN, BY H. STJ. B. PHILBY

Mrs. Horsfield's interesting account of her visit to Kilwa in southern Transjordan in 1932 (*Geogr. J.* 102 (1943)) raises two points of considerable importance, on which it seems well worth while to offer some comments. Her use of the name "Horsfieldberg" for the hillock at Kilwa and her views on the antiquity of the camel in Arabia are open to criticism. In examining these problems I have had the assistance of Miss Diana Crowfoot, of the Royal Geographical Society, who has been in correspondence with Mrs. Horsfield on the points raised by me, and also with Miss Caton-Thompson and others, while Mr. J. W. Crowfoot has drawn my attention to a review in the *Antiquaries Journal* for January–April 1944 of Colonel Dunbar's book, 'The rock pictures of Lower Nubia' (Service des Antiquités de L'Egypte). Unfortunately it has not been possible for the moment to procure a copy of the book itself, which presumably throws considerable light on the history of the camel.

To take "Horsfieldberg" first: the map of Arabia has so far been kept very satisfactorily free of fanciful or commemorative names; and a note of warning should perhaps be sounded against this innovation, which was apparently first

proposed by the Frobenius expedition of 1934–35 and was adopted in Rhotert's 'Transjordanien' and in a review of that work by Professor Dorothy Garrod in *Man* for April 1939. The archaeologists may have special reasons for adopting special labels of this kind; but geographers should eschew the temptation to invent names unless it is absolutely necessary to do so, *e.g.* in uninhabited lands where the topographical features have no names. The sketch-map on p. 72 of the August *Journal* shows Kilwa as a ruin but does not show Horsfieldberg; and I would suggest that, if this hillock is to be shown on future maps, its proper name should be ascertained and used. It will almost certainly be found to have an Arabic name.

I would tentatively suggest that that name is Kilwa, a perfectly normal Arabic word meaning "kidney" and in full accord with the common Arab practice of naming hill features after parts of the human body, *e.g.* Qadam, Karsh, Kabd, Qulaib, Zubb, Air, Wark, Kitf, Farj, Usba', Saq, Ras, Khashm, and many others with their derivative forms like Ruwais, Wuraik, etc. In making this suggestion I assume that Mrs. Horsfield has spelt or transliterated the name correctly, but I am shaken in this by her statement that "Kilwa is the word for a monastic cell and derives from the Greek Kellion or Kalyba" and by later information received from her to the effect that the Arab Archbishop of 'Amman told Mr. George Horsfield that Kilwa was the Syriac word for a monastic cell. As the words Kellion and Kalyba obviously have no affinity with each other it is rather unsatisfactory being given the choice between them as the source of Kilwa. Kalyba is certainly a Greek word meaning "hut" and could fairly be equated with Kilwa if it were necessary to seek an explanation of the latter outside Arabia. On the other hand Kellion is not to be found in Liddell and Scott, though Mrs. Horsfield notes that it and another form (Kelli) appear in Jannaris' dictionary of modern Greek with the meaning of "cell." The word would seem to derive from the Latin Cella, meaning "store-room," "hiding-place," etc., and doubtless came into Greek through ecclesiastical channels. Incidentally it has no connection with Doughty's Kella, which is of course the Arabic Qal'a, and philologically it is difficult to equate Cella or Kellion with Arabic Kilwa. We now seem to come into conflict with the Arab Archbishop of 'Amman, whose authority is obviously not to be lightly disregarded. The conflict is, I think, more apparent than real. Without any knowledge of Syriac, which after all is a Semitic language closely akin to Arabic, I suggest that the word he actually used was not Kilwa but Khilwa, a common Arabic word signifying "loneliness," "solitude," and the like, *cf.* Khala (desert), Khalwa (privacy), Khalawi (eremite), etc. And it so happens that among the meanings of Khilwa (or Khalwa) given by Steingass in his standard Arabic dictionary is "temple of the Druses!" It rather looks as if the ordinary Semitic word for a hermit's cell has come to be equated in popular etymology with the rather similar Latin-Greek word meaning much the same thing. In any case we are confronted by the question whether the locality under discussion should be shown on our maps as Kilwa or Khilwa. That is a question of fact which there should be no difficulty in resolving by reference to the Transjordan authorities. If the name attaches to the ruins it is probably Khilwa; but I should not be surprised if Kilwa turns out to be the correct name applying to the hill feature which the archaeologists know as "Horsfieldberg."

I now turn to the problem of the camel. Mrs. Horsfield's statement that the camel "first appeared in literature in the reign of the Persian King Nabonidus in the sixth century B.C." is incorrect. "Persian" is of course a mere slip of the pen for "Babylonian" and does not affect the argument. The reign of Nabonidus extended from 556 to 538 B.C. while, according to Dr. Ditlef Nielsen ('Handbuch

der altarabischen Altertumskunde,' vol. I, p. 81), camels are listed among the booty captured from the Minaeans in the Marib dam inscriptions of the Sabaean Mukarrib Ithi-'amara Bayin, who was a contemporary of Sargon, king of Assyria from 722 to 705 B.C. Furthermore Handcock in 'Mesopotamian Archaeology,' 1912, p. 90, informs us that "in Assyrian times the camel is often named in connection with sales of estates." A sculpture of Ashur-bani-pal (668–626 B.C.)in the British Museum, illustrated in L. W. King's 'History of Babylon,' 1919, depicts single-humped camels (each bearing two riders) in a scene representing war against the Arabs. Layard in 'Nineveh and Babylon,' 1853, p. 582, pictures two Arabs with a saddled baggage-camel from the palace of Sennacherib at Kouyunjik (705–681 B.C.), while, going still farther back, M. Jastrow in 'The civilization of Babylonia and Assyria,' 1915, pictures two double-humped camels as part of the tribute of conquered nations represented on the obelisk of Shalmaneser III of Assyria (858–824 B.C.), which is also in the British Museum. I am indebted to Miss Crowfoot for a reference to Rawlinson 'Cuneiform inscriptions' (I, 28, 27a), relating to double-humped breeding camels pictured on the broken obelisk of Tiglath Pileser I (1130–1100 B.C.). I have not been able to verify this reference or another to a theriomorphic vessel of a single-humped camel from Abusir el-Melik, apparently of about the First Dynasty (say 3200 B.C.). (S. R. K. Glanville, *J. Egypt. Arch.* 12 (1926)).

These early literary references to the camel take us back at least five centuries beyond the point suggested by Mrs. Horsfield. Furthermore, without going into the knotty problem of Old Testament dates, it may reasonably be suggested that the mention of camels in connection with Abraham's sojourn in Egypt (Genesis xii. 16) is not merely a shocking anachronism. Job also (Job i. 3) is represented as having possessed three thousand camels, and I find little difficulty in believing it. These biblical stories take us back seemingly to about 2000 B.C. to find the camel playing the domestic part it plays to this day. It must have taken a long time to domesticate, and the rocks of Arabia bear abundant witness to the activities of the camel in roles similar to those it still fills. It is of course difficult to date such pictures, but Mrs. Horsfield has no hesitation in dating the rock-pictures of camels at Kilwa back to mesolithic times, which may roughly be located somewhere between 5000 and 10,000 B.C. (her own suggestion is 6000 B.C.). She even goes as far as to suggest that "these Kilwa drawings of dromedaries must be the earliest known" and maintains that the Kilwa pictures represent the most westerly point reached by the "mesolithic dromedary"; it is surely reasonable to infer that the camel was familiar enough to the Arabs farther east at an earlier date and may well have been pictured by them on their rocks.

Mrs. Horsfield assumes from the absence of camels in the rock-drawings of Egypt before the third century A.D. that the camel was not known to the Egyptians before that time. The Abraham story confutes her for what it is worth; but there now appears to be some better evidence than that regarding the camel in ancient Egypt. According to the reviewer of Colonel Dunbar's book "the chronologies assigned by Dr. Frobenius and Dr. Schweinfurth . . . to the first appearance of the camel in Africa must be regarded with caution." Unfortunately we are not told what dates they suggested, but reference is made to a rock-picture of a camel on which Dr. Schweinfurth relied for his date, whatever it was. Most unfortunately however the rock in question has since been destroyed and "this historical document is now lost." A further important piece of evidence is however available in the shape of a camel-hair rope discovered by Miss Caton-Thompson in the Fayum and discussed in her book 'The Desert Fayum.' Her conclusion regarding the date of this relic of antiquity

(p. 113) is that "while a Third Dynasty date is practically certain, an early Fourth is also probable." In other words the hair of (presumably domesticated) camels was being used for the making of ropes in Egypt about 3000 B.C. Miss Caton-Thompson makes it clear that, while this rope "is at least one bit of concrete evidence which I believe to be certain," it does not necessarily prove that the camel existed in Egypt at the time suggested. It might for instance have come from Arabia or elsewhere in the course of trade. It is a strange fact, and difficult to explain, that the camel never appears in the dynastic pictures of Egypt that have survived to our own times. (See above reference to Abusir.)

In sum the archaeological evidence seems to suggest that the camel was a familiar feature of the Middle East (including Arabia) scene from early neolithic times onward, and it is reasonable to assume that its domestication began in mesolithic times when man was passing from the hunting to the pastoral and agricultural stage. The geological background of the animal suggests the probability of its existence throughout this area from Middle or Late Pleistocene times, and even earlier, as its fossil remains have been found in Pleistocene (or Pliocene) deposits in countries as widely separated from each other as Kashmir, Russia, Romania, and Algeria. (See Encyclopaedia Britannica, article on Tylopoda.) The fact that no such remains have been found in Arabia itself and the contiguous countries is probably due to the circumstance that very little systematic geological work has yet been attempted in such countries. In conclusion as regards dynastic Egypt I would suggest that in the days of uncontrolled or ill-controlled Nile flooding the country was not very suitable for the use of camel transport, though it is difficult to think that the ass took the place of the camel in the long waterless marches of the Libyan desert, if it was anything like what it now is. Subject to Colonel Dunbar's views I would suggest that there is no reason to suppose that the camel is a recent intruder in Arab lands. And finally I would suggest that in talking or writing about camels the use of the word "dromedary" should be avoided unless a dromedary (riding-camel) is actually meant.

SURINAM

A monograph on Surinam, by J. Warren Nystrom, which we have recently received from the Netherlands Information Bureau, is a useful contribution to our knowledge of a relatively little-known region. After a comprehensive summary of its physical geography and history, he examines in some detail the difficulties which have prevented the colony from becoming self-supporting. At present the finances are prosperous, owing to the demand for bauxite in the United States, but this cannot be relied upon indefinitely. In the past several agricultural products have been tried, but a series of misfortunes has led to their abandonment. Bananas and cacao were stricken by disease; coffee, owing to a bitter taste, has not found an international market; and conditions for sugar growing are not entirely satisfactory. Lately rice cultivation has been successfully introduced, but the low relative value of the crop, for which markets in the West Indies might be found, cannot redress the trade deficit significantly.

Besides these individual misfortunes there are several fundamental factors limiting economic development. The area of agricultural land for example, restricted to the dyked coastal plain, is limited, and the necessary drainage ditches hinder large-scale cultivation. The chief difficulty is probably the isolation of the colony: as it lies off the main world trade routes, transport is expensive and irregular. Nearby countries, producing similar crops, offer no considerable markets. The mixed origins and characteristics of the population have also created problems. The creoles since emancipation have largely

abandoned farming, and lack incentives to economic advance. The bush negroes, who monopolize the lumbering labour-supply, are unreliable and difficult to control. The British Indians and Javanese, on the other hand, have been more successful at cattle raising and rice growing. Without large capital investments in transport and development schemes, the returns on which must be problematical, much progress cannot be anticipated. The country has a good health record, and it is possible that a tourist traffic might be developed. Since the war some improvements have been made to the roads, mainly near the bauxite centres. The strategic position of the colony has led to heavy expenditure by the United States on an air base at Sanderey and a seaplane base at Paramaribo.

CATALOGUE OF UNION PERIODICALS

We have received from Mr. Percy Freer, Librarian of the University of the Witwatersrand, volume one of the 'Catalogue of Union periodicals' edited by him for the National Research Council of South Africa. Its primary purpose is to enable students to discover in which South African libraries they may find individual scientific periodicals, especially where the references have been severely abbreviated. Each main entry includes an indication of the holdings of Union libraries, the abbreviated title used in the 'World list of scientific periodicals,' and where required a note on the history of the publication. The catalogue, which includes more than six thousand entries in seventy-seven libraries, will enable important gaps to be discovered and ultimately filled. Geography, incidentally, makes rather a poor showing: it is a little surprising to find that there is only one complete set of the reports of the international geographical congresses, and of the *Annales de Géographie*, listed.

In arranging the material the editor has not followed the system of the 'World list,' where the entries are placed under the first word of the title or under the common title, *e.g.* Report, Annales, etc. He takes as the main heading the subject indicated in the title either of the periodical or of the responsible institution: sub-divisions are by language and ultimately by country. Thus the *Geographical Review* appears under Geography: English (America), and the *Australian Geographer* under Geography: English (Britain overseas). Some confusion might arise where there is more than one recognized language in a country: the *Bulletin* of the Egyptian Geographical Society appears for example under Geography (French), but cross-references provide against it being overlooked. The term used in the title provides the main heading although there may be alternative terms in the same language, *e.g.* Erdkunde and Länderkunde, but where there are only slight differences they are brought together. These instances are given to show, as is emphasized in the introduction, that this is not a subject catalogue of periodicals, as a cursory glance might suggest. Apart from the fact that no attempt is made to indicate the exact content of each publication, the method sometimes brings a variety of subjects together; under "Land" for example there are German, Dutch, and other periodicals dealing with geography, geology, surveying, and agriculture. If used with care however it gives some help as a guide to subjects, though, as it naturally includes South African holdings only, its general use is limited. A subject index to scientific periodicals is much needed, and this work indicates indirectly some of the difficulties to be overcome. As to its main use, the identification and locating of sets, those who have become accustomed to the method of the World List can decide on its merits only after trial.

OBITUARY

LIEUTENANT-COLONEL MORICE CHALLONER LAKE, C.M.G.

Lieut.-Colonel M. C. Lake, who died on 25 July 1943, was well known in South-West Arabia for many years. Since his retirement from Government service in Aden in 1940 he had represented the British Council in Arabia and the Persian Gulf; but he will be chiefly remembered in connection with Aden and the Aden Protectorate, where he served almost continuously for twenty-seven years.

Born on 28 May 1885, the son of Mr. H. J. Lake, barrister-at-law, he was educated at Wellington and Sandhurst, and commissioned in 1904. He joined the Indian Army in 1905, serving in the 24th Punjabis and the 109th (Indian) Infantry. He went to Aden with the latter regiment in 1913, served in the Aden Field Force 1915–16, and commanded the Aden (Arab) Labour Corps, 1917–18. He raised and commanded the 1st Yemen Infantry, 1918–25. Having been appointed Adviser to the Colonial Office and the Air Ministry on the raising of Arab Levies and initiation of an Intelligence Service, in 1928 he raised and commanded the Aden Protectorate Levies, of which he became honorary colonel in 1933.

Lake's conversion of wild tribesmen into well-trained soldiers deserves more than this bald statement. When Major Lake, as he then was, took command in 1918 of an Arab Legion partly raised during the preceding year, the regiment was officially designated 1st Yemen Infantry; for the modern independent kingdom of the Yemen had not then taken shape. Some of the best Arabs from the disbanded Aden Labour Corps were enrolled in the new regiment, and after the Armistice in 1918, when the Turks withdrew from the Yemen and the invaded parts of the Aden Protectorate, Lake travelled in the interior to get recruits from the most warlike tribes. This resulted in several hundred fine recruits, especially 'Azzanis and 'Aulaqis, returning with him to headquarters at Sheikh 'Othman. Within a few years a degree of mutual understanding and coordination worthy of a regiment with a much longer history was attained. In 1924 there were ten British and fourteen Arab officers; the more than four hundred combatant Arab ranks represented nearly all the tribes of South-West Arabia to as far north as San'a, while the Zeidi minority cooperated harmoniously with the Shafa'i majority. Men drawn from tribes often at war with one another behaved well together in the regiment.

Colonel Lake took full advantage of the disposition of these slight but sturdy warriors, most amenable to discipline, full of humour, and ready to execute any orders carefully explained. He attended to elementary education by starting a regimental school, supervised games and physical training, and personally trained the signallers.

Appointed Political Officer in 1928, Lake was soon after promoted Political Secretary. During periods in 1935 and 1936 he was Acting Resident, and, after the transference of Aden to the Colonial Office in 1937, he was Acting Governor for parts of that year and of the two following years. He received the MacGregor Memorial Medal of the United Service Institute of India in 1927, and the Star of Ethiopia in 1933, when the Emperor of Ethiopia visited Aden and British Somaliland. He was created C.M.G. in 1936.

Lake, who joined our Society in 1921, was a keen and observant traveller and a good photographer. His unpublished record of his recruiting journey to places then unmapped and very little known was of great value. He visited San'a with Sir Gilbert Clayton's Mission in 1926, again in 1932 at the invitation

of the Imam, and in 1934 to exchange with the same potentate, as King of the Yemen, ratifications of the Treaty of San'a.

Colonel Lake drew up the useful pamphlet 'South-West Arabia: transliteration of names,' first published by the Aden Government in 1933, re-published after revision in 1937. This was produced in order to arrive at some degree of uniformity in the spelling of personal, tribal, and place-names. In an introductory note to Part 2 (Place-Names) he gave his reasons for diverging from the system used in the 'First list of names in Arabia (N.W. and S.W.),' published by the Permanent Committee on Geographical Names, as regards certain vowels and diphthongs, in order to render correctly the local pronunciation of the south-west.

His memory will be held in honour for his service to the Empire during many years, in peace and war. H. S.

MEETINGS: SESSION 1943–44

First Meeting, 11 October 1943. The President in the Chair

Elections: Kenneth Bartholomew; Bimbashi Hilary Bell; Miss Hilda Mary Clarke, B.A.; John de Quetteville Dodds; Miss Jane Morris Galbraith; Ian Gilmour; Arthur Joseph William Green; Albert William Francis Hallam, F.R.A.S.; Major W. Howarth, A.E.C., B.A.; Dr. Morris Frank Korn; Dr. Eva Morton; Major William Forbes Amyas Preston, R.A. (ret.); Miss Olwyn Daphne Reynolds, B.A.; Captain Vernon George John Sheddick; James Stobart; Rev. William Ward, D.D.; Arthur Abraham Werner; Rt. Rev. William C. White; Thomas Wood, M.A., D.MUS.; Eric Guy Wyatt

Paper: Some aspects of the County of London Plan. By Professor Patrick Abercrombie

Second Meeting, 18 October 1943. The President in the Chair

Paper: Physical names for the map of Great Britain. Discussion of paper published in the July *Journal*. By Dr. E. C. Willatts

Third Meeting, 25 October 1943. The President in the Chair

Geographical Films: Flying boats over Africa. Commentary by Mr. Ronald W. Waugh

Fourth Meeting, 8 November 1943. The President in the Chair

Elections: Commander C. R. Burgess, O.B.E., R.N.; Major John L. Christian; Miss Norah Florence Edwards; Lieut. William J. Frank, B.S., M.S.; G. T. Whitfield Hayes; Laurence J. Ling; Major Edgar L. Morris, B.S., LL.B.; Major Ivan Neill, R.E.; George Percival Kay; Charles Edmund Pritchard, M.A.; Mrs. Mary Rice Schooley; Ralph Sibley, A.C.P., M.R.S.T.; Miss Monica V. Walmsley

Paper: Greece and Aegean Islands. With kodachrome films. By Dr. Douglas Guthrie

Fifth Meeting, 15 November 1943. The President in the Chair

Paper: The international regime of the Danube. By Mr. Otto Popper, Technical Adviser, Czechoslovak Government

Sixth Meeting, 22 November 1943. The President in the Chair

Geographical Films: The Irrawaddy and the Shan States. Commentary by U. Myat Tun